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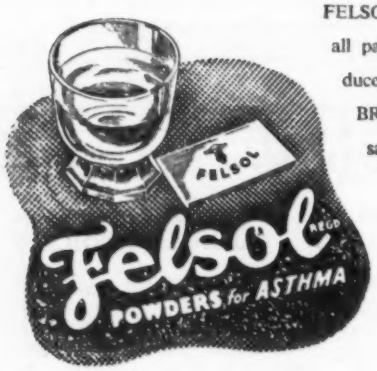

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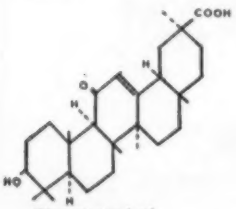

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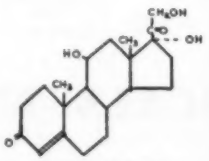

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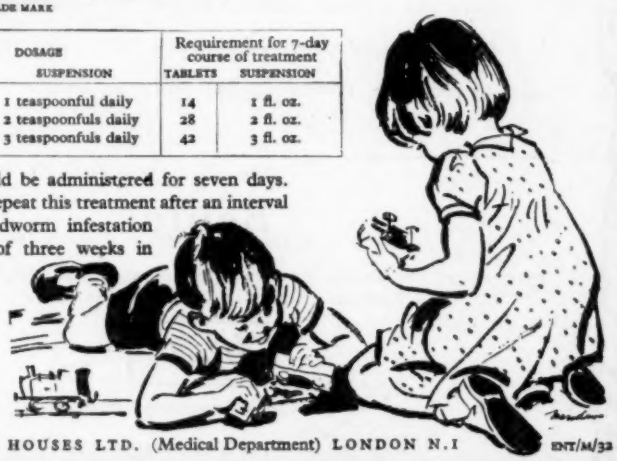

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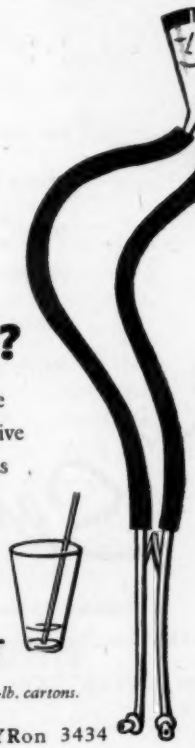

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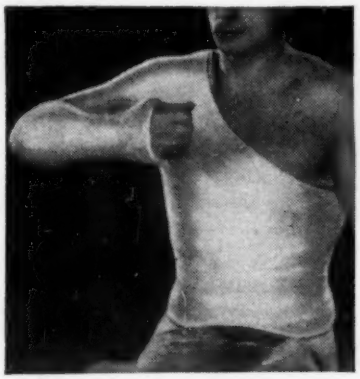

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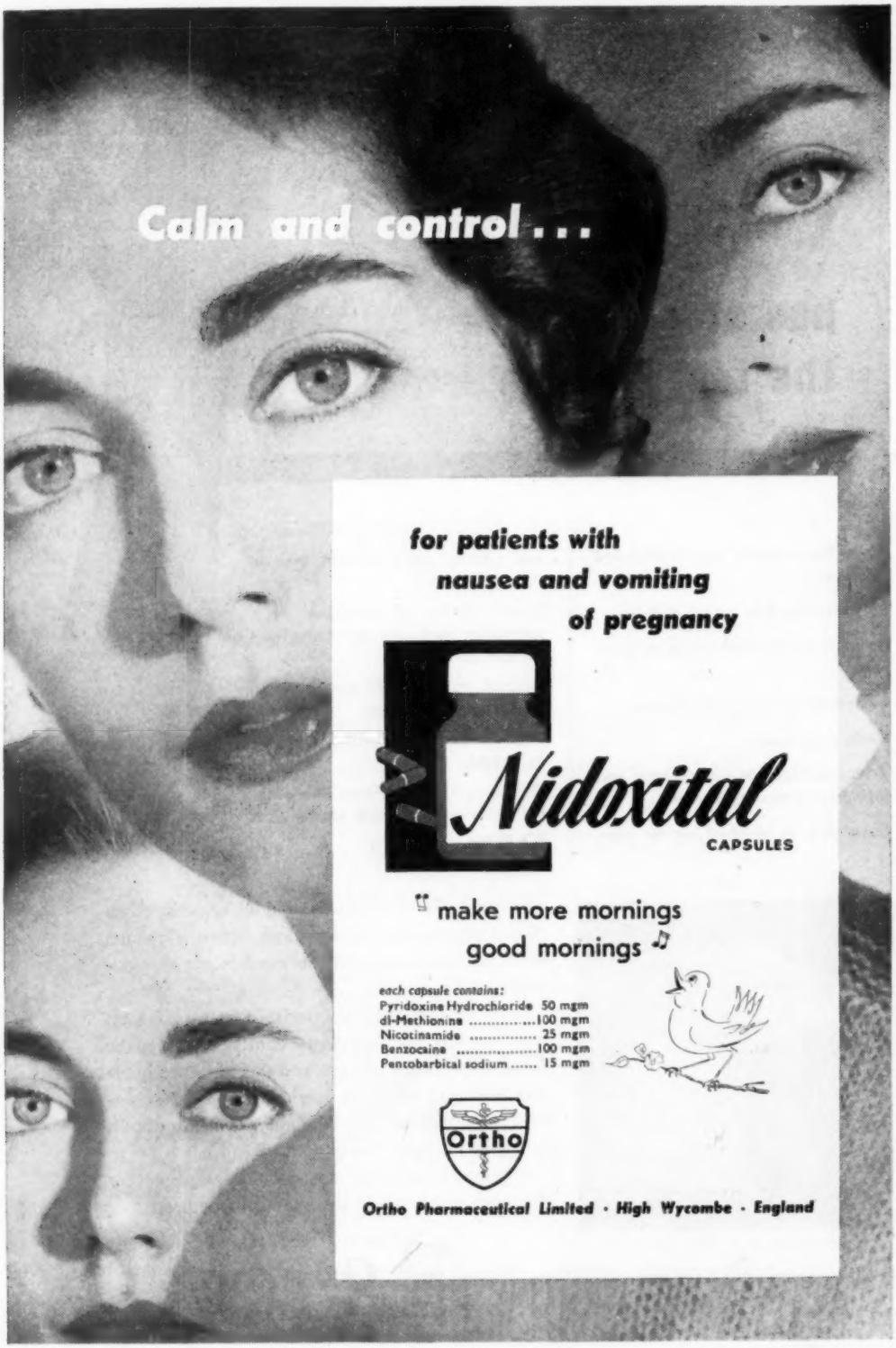
Gypsona is by far the most economical plaster for the modern functional treatment of fractures.

SMITH & NEPHEW LTD · WELWYN GARDEN CITY · HERTS 1856 S&N 1956 Gypsona TRADE MARK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for patients with
nausea and vomiting
of pregnancy
Nidoxital
CAPSULES
make more mornings
good mornings
each capsule contains:
Pyridoxine Hydrochloride 50 mgm
dl-Methionine ..... 100 mgm
Nicotinamide ..... 25 mgm
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Pentobarbital sodium ..... 15 mgm
Ortho
Ortho Pharmaceutical Limited · High Wycombe · England

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Research

The House of Wander continues to maintain its advanced position in pharmaceuticals and quality food products because the standardization of active ingredients during manufacture is backed by careful control and investigation in its extensive Research Laboratories.

In Quality

The Wander Research Laboratories have made useful contributions in the fields of dietetics, nutrition and vitamins. Their wide experience and up-to-date laboratory facilities help to maintain the high quality of Malt Extract and Cod Liver Oil (Wander), the vitamin content of which exceeds that of the analogous B.P. preparations.

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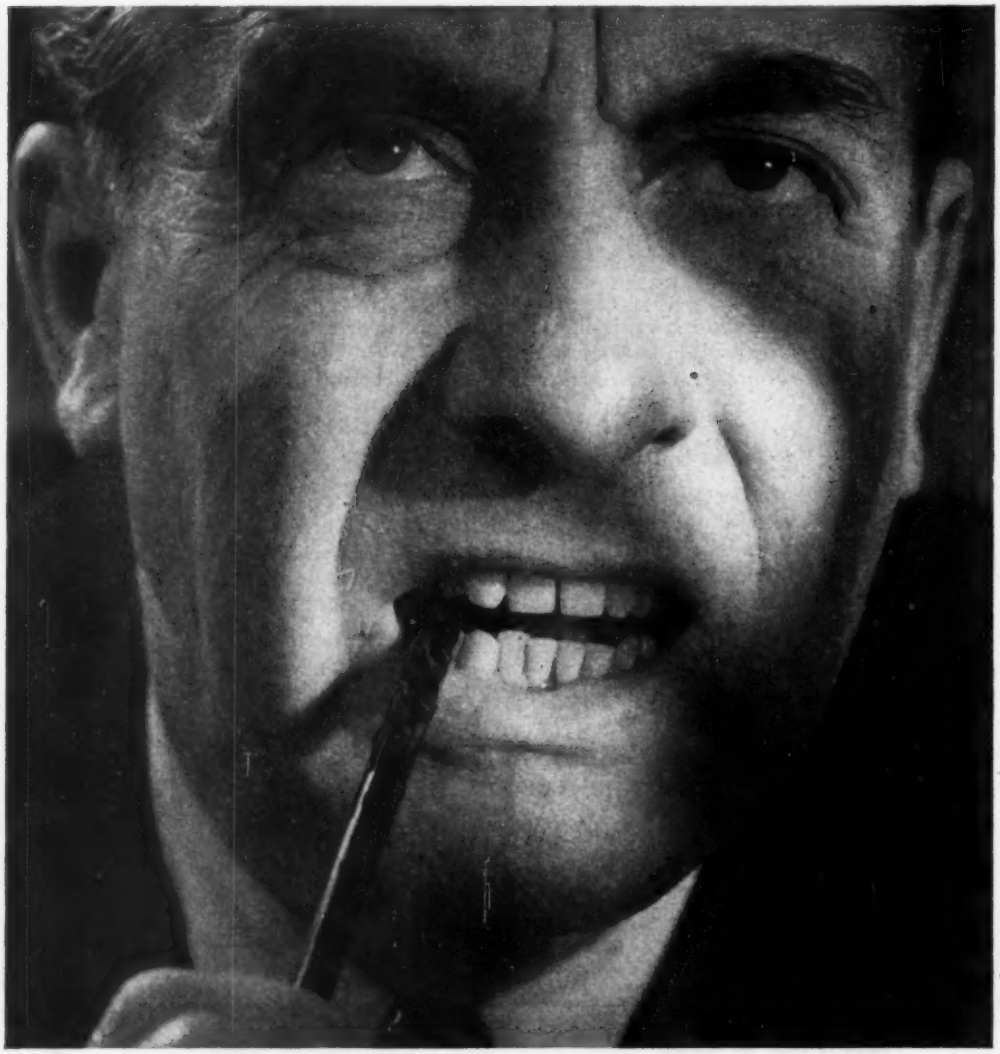
M.352

ASPECTS OF A CONDITION



A chewed pencil... a small thing perhaps, but the outward sign of an inner disturbance.

Covatin provides daytime sedation without hypnosis · Covatin is to be preferred to phenobarbitone in that it does not interfere with the alertness of the patient · Covatin is not habit-forming and has no side-effects · Covatin is available as 50 mg. sugar-coated tablets in bottles of 50 and 500.

Covatin

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Formula: p-butylthiodiphenyl-methyl-2-dimethylaminoethyl sulphide hydrochloride

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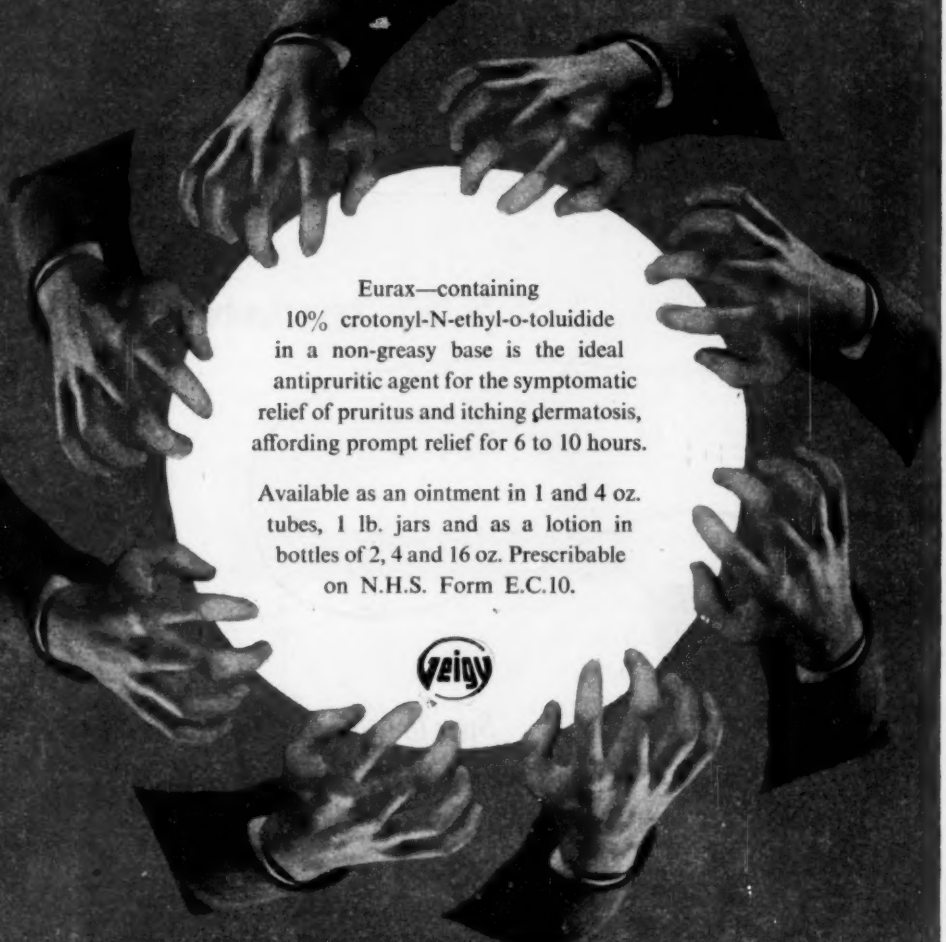
12

EURAX ANTIPRURITIC

REGD. TRADE MARK

Ointment and Lotion

Prompt relief · Prolonged effect



Eurax—containing 10% crotonyl-N-ethyl-o-toluidide in a non-greasy base is the ideal antipruritic agent for the symptomatic relief of pruritus and itching dermatosis, affording prompt relief for 6 to 10 hours.

Available as an ointment in 1 and 4 oz. tubes, 1 lb. jars and as a lotion in bottles of 2, 4 and 16 oz. Prescribable on N.H.S. Form E.C.10.

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13

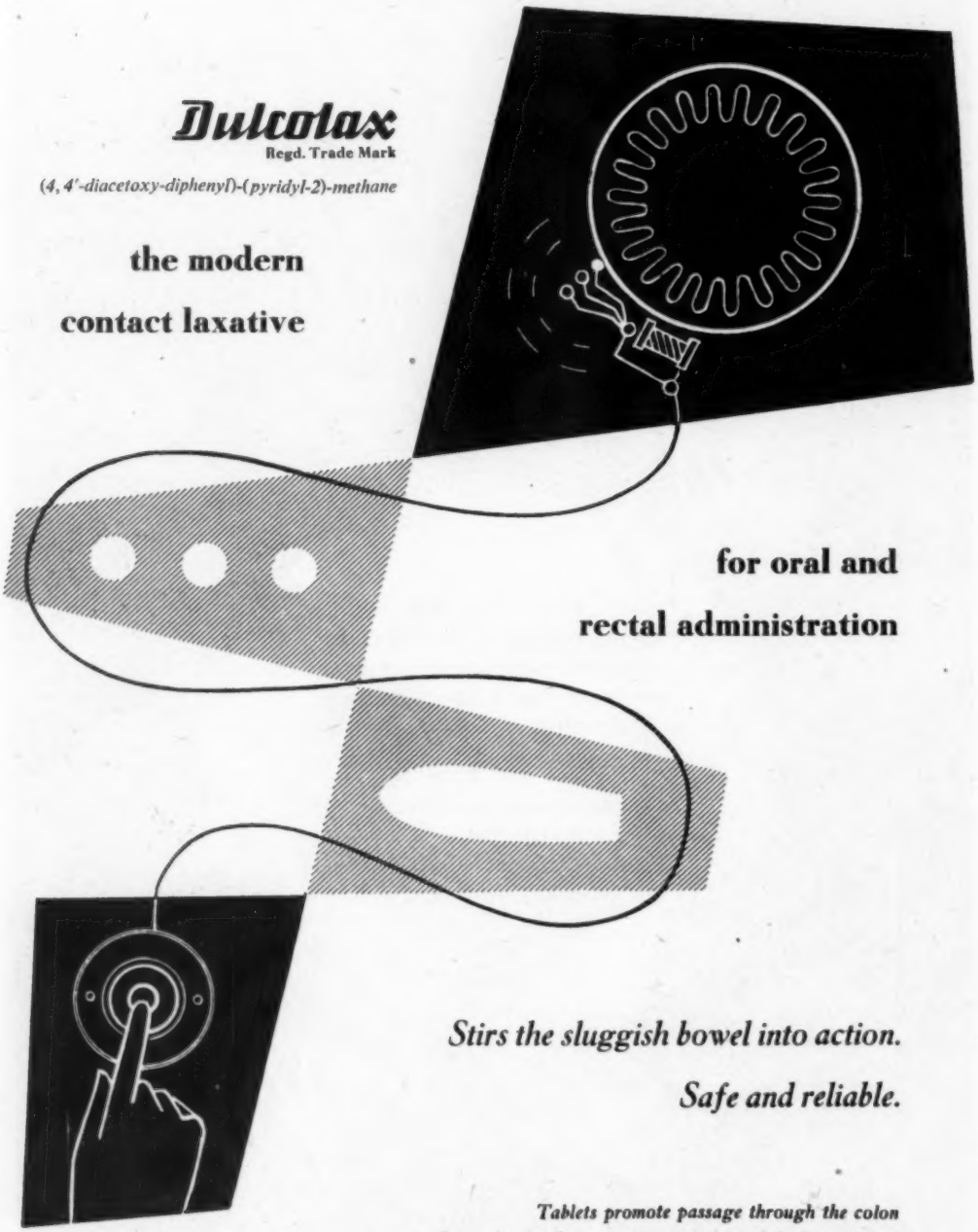
Dulcolax

Regd. Trade Mark

(4, 4'-diacetoxy-diphenyl)-(pyridyl-2)-methane

the modern

contact laxative



for oral and

rectal administration

Stirs the sluggish bowel into action.

Safe and reliable.

Tablets promote passage through the colon
Suppositories for prompt evacuation of the lower bowel

Dulcolax enteric coated tablets of 0.005 g. · Bottles of 30 and 200
Dulcolax suppositories of 0.01 g. · Boxes of 6 and 50

LEWIS LABORATORIES LTD., LEEDS 9

She's more than a cosmetic problem

Each capsule contains:

d-Amphetamine Sulphate	5 mg.
Vitamin A	1670 I.U.
Vitamin D	167 I.U.
Thiamine Mononitrate (B_1)	1 mg.
Riboflavine (B_2)	1 mg.
Niacinamide	20 mg.
Calcium Pantothenate	0.34 mg.
Pyridoxine HCl (B_6)	0.34 mg.
Folic Acid	0.34 mg.
Vitamin B_{12}	0.34 mcgm.
Ascorbic Acid (C)	20 mg.
Methylcellulose	200 mg.
Iron ($FeSO_4$ exsicc.)	3.34 mg.
Calcium ($CaHPO_4$)	140 mg.
Phosphorus ($CaHPO_4$)	108 mg.
Iodine (KI)	0.5 mg.
Fluorine (CaF_2)	0.1 mg.
Copper (CuO)	1 mg.
Potassium (K_2SO_4)	5 mg.
Manganese (MnO_2)	1 mg.
Zinc (ZnO)	0.5 mg.
Magnesium (MgO)	1 mg.
Boron ($Na_2B_4O_7$)	0.1 mg.

When weight reduction is a necessity, reducing diets introduce their own problems. Hunger pangs weaken the patient's will-power. The risk of nutritional deficiencies can be very real. REVICAPS REducing VItamin CAPSules are scientifically formulated to control obesity. They contain d-amphetamine to suppress the appetite and elevate the mood, bulk-producing methylcellulose to allay hunger, and a full complement of vitamins and minerals to prevent dietary deficiencies.

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In bottles of 100

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cicatrin

to counter the changing pattern of bacterial resistance

All the available evidence of the development of bacterial resistance points to the need for a safe and effective means of securing control of local infections without the employment of those antibiotics which are of greatest value for systemic use.

a new advance in wound therapy:

CICATRIN has advantages over existing modes of wound therapy for the following reasons:—

- ★ is bactericidal and bacteriostatic.
- ★ minimizes the risk of the development of resistant strains.
- ★ is effective against most of the pathogens including those resistant to penicillin and streptomycin.
- ★ Healing is stimulated by selected amino acids.
- ★ is not cyto-toxic.
- ★ is active in the presence of blood and tissue exudates.
- ★ is non-allergenic.

FORMULA: Each gramme contains:
Neomycin Sulphate 5 mg.
Zinc Bacitracin 250 units.
l-Cystine 2 mg.
dl-Threonine 1 mg.
Glycine 10 mg.

PACKS: 15 gramme Sprinkler **PRICE** 6/- (plus P.T.)
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cream and powder

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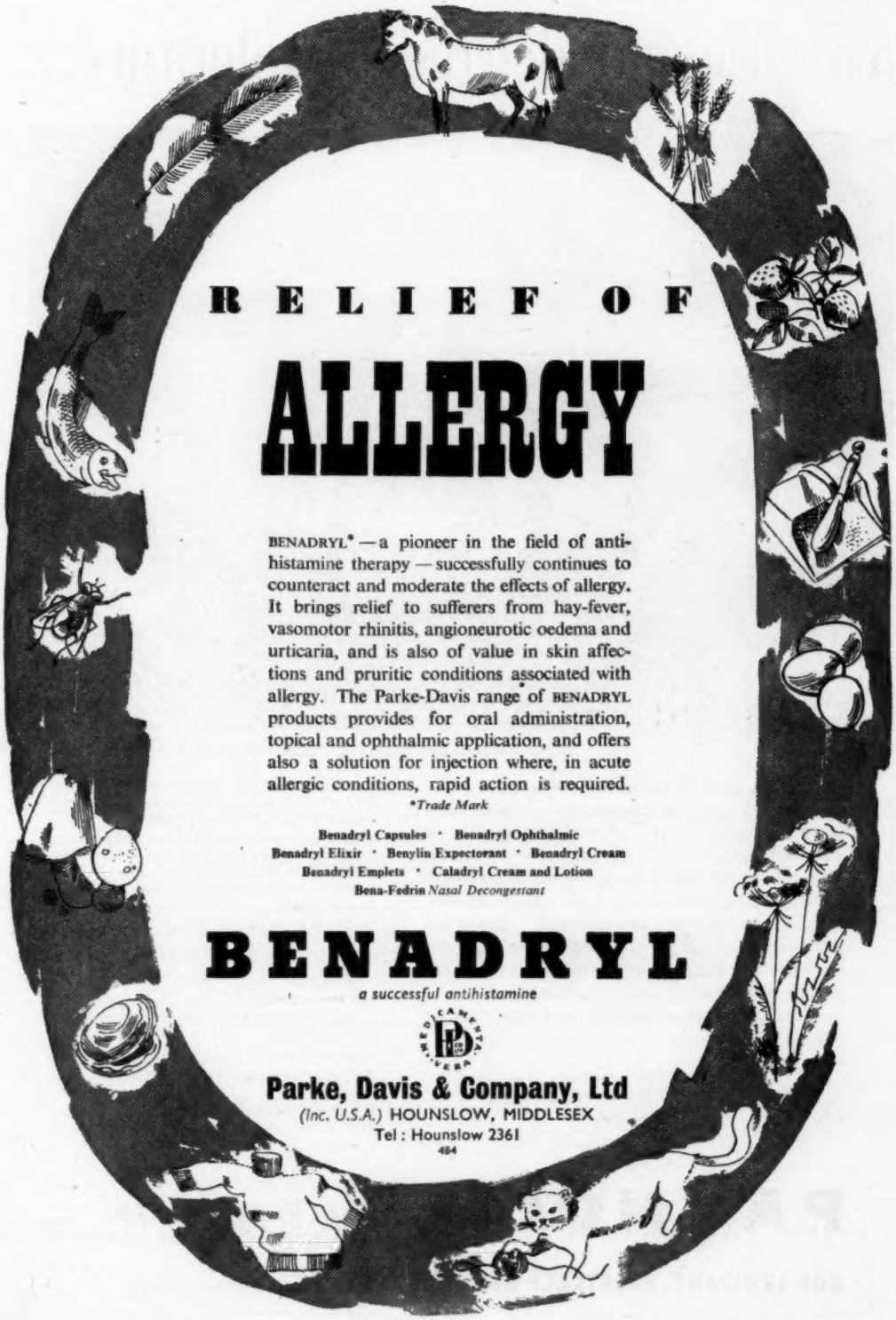

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ALLERGY

BENADRYL* — a pioneer in the field of antihistamine therapy — successfully continues to counteract and moderate the effects of allergy. It brings relief to sufferers from hay-fever, vasomotor rhinitis, angioneurotic oedema and urticaria, and is also of value in skin affections and pruritic conditions associated with allergy. The Parke-Davis range of BENADRYL products provides for oral administration, topical and ophthalmic application, and offers also a solution for injection where, in acute allergic conditions, rapid action is required.

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Benadryl Capsules · Benadryl Ophthalmic
Benadryl Elixir · Benylin Expectorant · Benadryl Cream
Benadryl Emplets · Caladryl Cream and Lotion
Bena-Fedrin *Nasal Decongestant*

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a successful antihistamine

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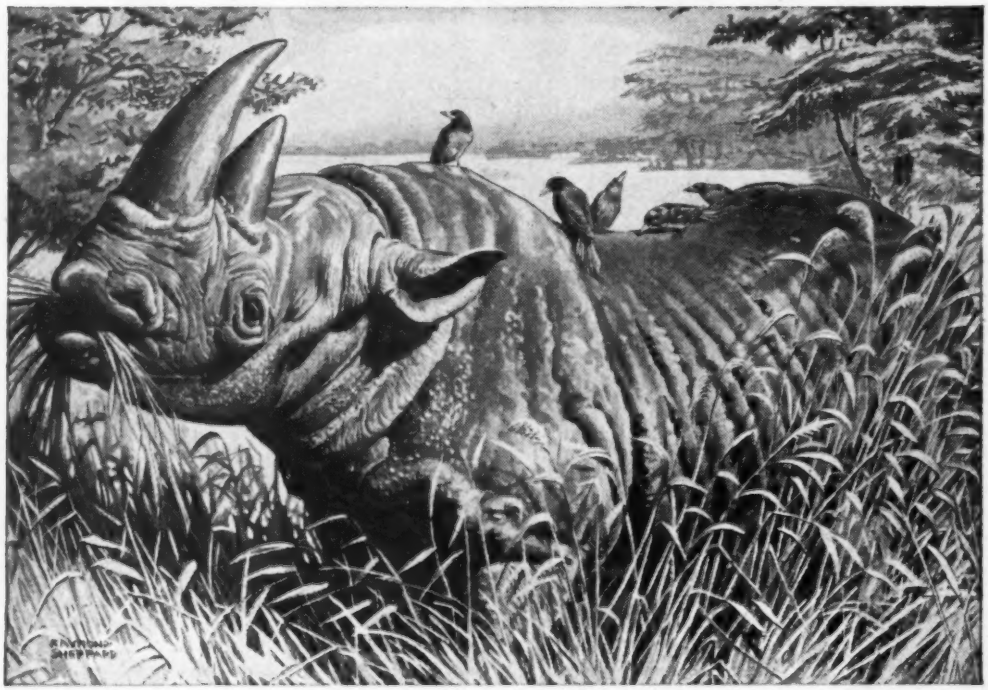
An unusual degree of tolerance...



WELL tolerated by patients undergoing long-term aspirin therapy in rheumatic conditions; easily taken by those who are nauseated by crushed or dissolved aspirin, or who cannot swallow tablets, Paynocil presents aspirin in its most acceptable form.

Gastroscopic investigation has shown Paynocil to be superior to aspirin tablets in causing less inflammation of the gastric mucosa, a constant risk with prolonged treatment. Paynocil tablets are equally suitable for occasional analgesia.

They disintegrate pleasantly and rapidly on the tongue without water.

REFERENCES

Practitioner, 173: 46, 1954: Brit. med. J., 2: 7, 1955.
Ibid., Editorial 2: 31, 1955.

THE OX-PECKER, *more commonly known as the Tick-Bird, is a native of Africa and is closely related to the Starling. Tick-Birds attend large game animals, moving about their backs in search of ticks—a service which would seem to merit thanks rather than mere tolerance. It is said they render a further service by making a hissing noise as a warning to their hosts at the approach of danger.*

Each tablet contains:

Acetylsalicylic acid..... 10 grains
Aminoacetic acid ..... 5 grains

Packages:

Cartons of 18 tablets in sealed metal foil strips.

Dispensing packs of 240 (Tax free): Basic N.H.S. cost. .....21/8d.

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NON-IRRITANT, PALATABLE ASPIRIN

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IN THE MENOPAUSE

One bottle of 60 TACE capsules (2 capsules a day) can relieve many of your menopausal patients. Some may require a second course, but few will need a third.

Merrell research

The introduction of TACE marks the beginning of a new era in the treatment of menopausal symptoms. TACE is stored in the body fat and subsequently released in a manner resembling normal hormone secretion. There is virtually no withdrawal bleeding (in four investigations [1, 2, 3, 4] there were only 7 cases of withdrawal bleeding in 257 patients) and TACE is also extremely well tolerated in other respects.

Because of fat storage the action of TACE is prolonged. In 13 out of 16 patients beneficial effects remained up to 4 months after therapy had been discontinued.[1]

TACE is indicated in other cases which require œstrogen therapy—for example in the inhibition of lactation and the treatment of prostatic carcinoma.

TACE

is available in green capsules (each containing 12 mg. chlorotrianisene dissolved in oil) in bottles of 60 and 300.

1. *Wis. med. J.* (1954) **53**:322.
2. *Amer. J. Obstet. Gynec.* (1954) **3**:201.
3. *J. Indiana med. Ass.* (1954) **47**:969.
4. *J. Clin. Endocr.* (1954) **14**:272.

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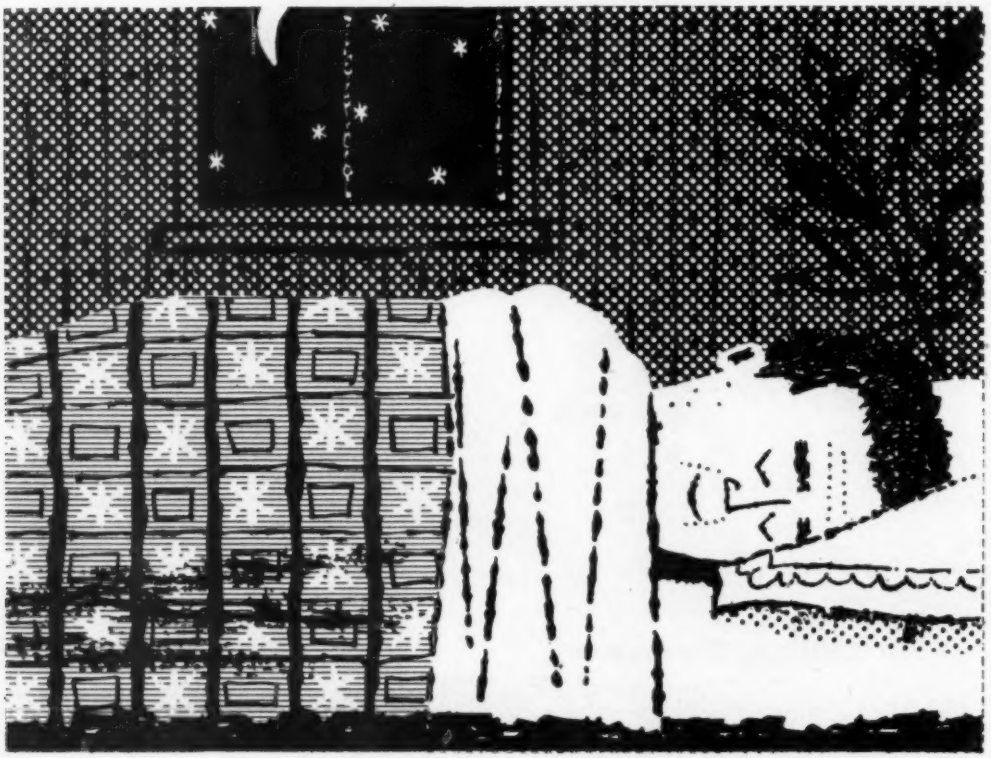


Relief from asthma—7,200 times

Tedral, taken at bedtime with Tedral Enteric Coated, provides asthmatics with eight hours freedom from asthma. Deep, easy and restful respirations will occur throughout sleep—that means around 7,200 times.

This prolonged relief is achieved by the delayed action. Tedral plain provides four hours of easy breathing—the enteric coated tablet acts after four hours, extending relief till the night is through. Therefore every breath taken during sleep will be free from distress.

Active Principles: Theophylline 2 gr. (120 mg) Ephedrine hydrochloride ⅜ gr. (25 mg) Phenobarbitone ⅛ gr. (8 mg).

Dose: During the **day** one tablet of Tedral every four hours. At **night** one tablet of Tedral and one tablet of Tedral Enteric Coated.

Pack: Tedral plain and Tedral Enteric Coated tablets are supplied in bottles of 50. Bottles of 500 supplied to chemists for dispensing. S.IV. poison.

WARNER

Tedral

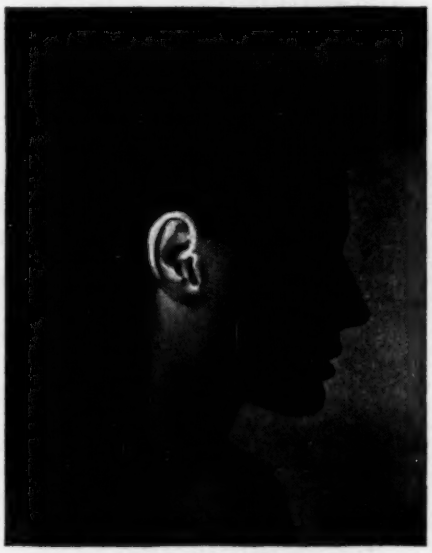
TRADE MARK

WILLIAM R. WARNER & CO. LTD., POWER ROAD, LONDON, W.4.

TED 385/4

EAR WAX

Removed this easy way



The removal of wax from the external auditory meatus has, in the past, normally entailed attendance by the patient for diagnosis and for the prescription of a suitable loosening agent, and a second attendance a few days later for syringing. Now, by the use of Cerumol Ear Drops, wax can be removed in most cases at one visit. A few drops of Cerumol can be instilled into the ear and, while another patient is being attended to, the soft cerumen dissolves and the harder wax disimpacts. The wax can then be removed by gentle syringing or with cotton wool. The wax may even be found to run out of the ear on its own accord, in which case patients themselves may instil Cerumol at home, obviating further attendances. Cerumol is anti-bacterial, non-irritating and harmless to the lining of the external auditory meatus or the tympanic membrane. Cerumol is included in Category No. 4 of the M.O.H. classified list and may be prescribed on N.H.S. Form E.C.10.

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for the easier removal of wax

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If you wish to test for yourself and have not received recently a 10 c.c. vial please write or telephone direct to :

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PACKS for Surgery Use : 10 c.c. vial — separate dropper included. (Basic N.H.S. price 2/8.) For Hospital Use : 2 oz. and 10 oz. bottles.

The esters of NICOTINIC, SALICYLIC and p-AMINOBENZOIC acids bring relief to cases of arthritis and rheumatism

"Thank you, doctor"

IN CASES OF soft-tissue rheumatism, and arthritic disorders, many doctors are tending more and more to regard Transvasin as an indispensable adjuvant to treatment.

For Transvasin is composed of the esters of nicotinic, salicylic and p-aminobenzoic acids. These esters readily pass the skin barrier in therapeutic quantities, and so enable an effective concentration of drugs to be built up where they are needed.*

Transvasin not only induces vasodilation of the skin with a superficial erythema, but also brings about a deep hyperaemia of the underlying tissues. It is non-irritant and can be safely used on delicate skins.

It is now being widely prescribed, with successful clinical results. Since a very small quantity is sufficient for each application, the cost of treatment is extremely low.

**Therapeutische Umschau VIII, 1952, 10, 143.*

Salicylic acid tetrahydrofurfuryl-ester...	14%
Nicotinic acid ethyl-ester.....	2%
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p-Aminobenzoic acid ethyl-ester.....	2%
Water-miscible cream base ad	100%

Transvasin is available in 1 oz. tubes, basic N.H.S. price 2/6 plus P.T., and is not advertised to the public. Samples and literature will be glady sent on application.

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Transvasin is the registered trade mark of Lloyd-Hamol Ltd.

Nature's defences...

...FOR ANIMALS

Nature's defences are so predictable. For the Stoat she provides a change of coat. Its fur, in summer a reddish brown above and white beneath, changes in the winter of northern latitudes to snowy whiteness to camouflage it from its enemies. It is then called an ermine. This colour change is induced in Nature by the decreasing light in autumn. The same effect can be brought about out of season by artificial light variations.

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Nature also provides predictable defences for man. In one of these—TERRAMYCIN, a broad-spectrum antibiotic derived from a tiny wrinkled mould found in the soil—she has provided man's most predictable means of defence against microbial attack. Effective in more than 100 infections, TERRAMYCIN with its rapid anti-microbial action and fewer side effects ensures a more positive defence against more organisms than any other anti-infective agent.

TERRAMYCIN* SF* (combined Terramycin and specific nutrients) is available to fortify the patient and, at the same time, to fight the infection.

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Available as :

'Ilotycin' Tablets: 100mg. and 250mg. Average daily dose: 1Gm., increased in severe infections.

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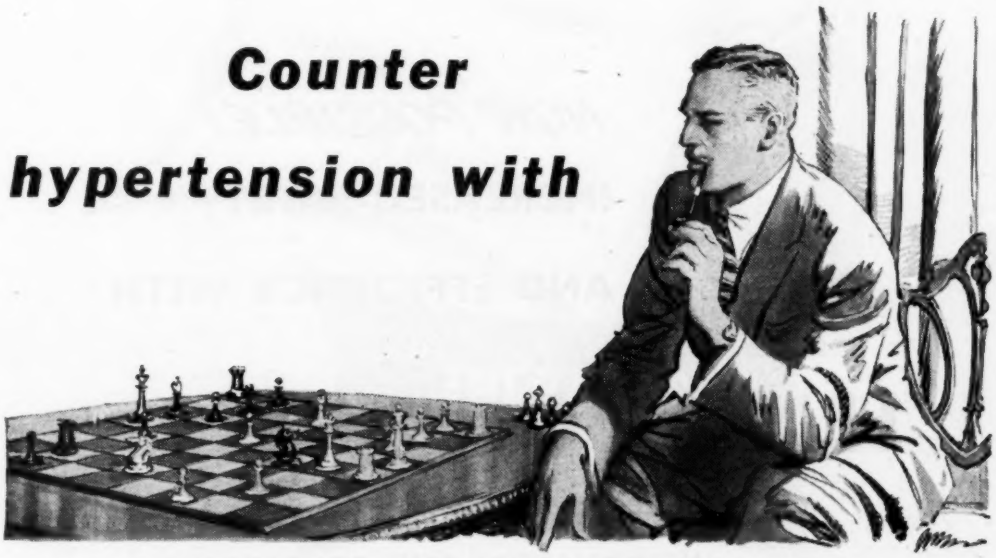
Counter hypertension with



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The standardized hypotensive alkaloids of *Rauwolfia serpentina* ('Rauwiloid') and *Veratrum viride* ('Veriloid') together provide a most effective and safe oral treatment for moderate to severe degrees of hypertension. 'Rauwiloid' widens the margin between the emetic and the antihypertensive doses of 'Veriloid', and enables therapeutic doses of 'Veriloid' to be given in almost every case of hypertension. This combination of drugs exerts a steady and prolonged hypotensive effect, and produces the minimum of discomfort to the patient.

"The addition of 'Rauwiloid' makes 'Veriloid' easy to administer, more effective and practically does away with unpleasant side-actions".

***Amer. J. Med.*, (1954) 17:629**

'Rauwiloid + Veriloid' tablets each contain 1 mg. of the alkaloids of *Rauwolfia serpentina* and 3 mg. (by biological assay in terms of reference standard) of those of *Veratrum viride*. The starting dosage is one tablet three times daily. The tablets are available in bottles of 100 and 500.

Full literature on request.

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'Rauwiloid' and 'Veriloid' are registered trade-marks. Regd. Users :

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NOW POSSIBLE!

INCREASED SAFETY

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HYDROMYCIN

IN THE TREATMENT OF INFLAMMATORY SKIN CONDITIONS

HYDROMYCIN by combining the anti-inflammatory properties of Hydrocortisone with the anti-bacterial properties of Neomycin offers increased safety over the use of Hydrocortisone alone. HYDROMYCIN is ideal in the treatment of contact dermatitis, atopic dermatitis and non-specific pruritus.

SKIN OINTMENT *Tubes of 5G and 15G*

EAR/EYE OINTMENT *Tubes of 3G*

THE FULL BOOTS BRITISH-MADE CORTICOSTEROID RANGE

CORTISTAB (Cortisone Acetate) Tablets, Injection, Eye Drops, Eye Ointment.
HYDROCORTISTAB (Hydrocortisone) Tablets, Local & Intravenous Injections, Skin Ointment, Eye Ointment, Eye Drops.
DELTA-STAB (Prednisolone) Tablets.
Delta-stab Tablets are at present available through N.H.S. hospitals only by arrangement with the Ministry of Health.

BOOTS PURE

Literature and further information obtainable from:
DRUG COMPANY LIMITED, NOTTINGHAM

Boots

An accepted combination in the chemotherapy of tuberculosis is P.A.S. together with isoniazid or streptomycin. Either combination, according to a recent Medical Research Council report (1), is very effective and helps to delay the appearance of resistant strains. P.A.S. has, however, the disadvantage of being poorly tolerated; many patients would welcome an alternative. **Therapas,** first synthesized in our laboratories in 1951, was introduced as an alternative to P.A.S. to which it is converted in the body (2). It has now been shown that it not only delays the emergence of strains resistant to isoniazid or streptomycin, when used together with either of these drugs, but has a therapeutic action *per se*. It gives satisfactory clinical and radiological results in the treatment of pulmonary tuberculosis (3, 4) and of genito-urinary tuberculosis(5). Since it has a sweet, not unpleasant, taste it is usually much preferred by the patient.

1 Report to M.R.C. of Tuberculosis Chemotherapy Trials Committee, *Brit. Med. J.*, 1955, 1, 435.

2 *J. Pharmacy & Pharmacol.*, 1953, 5, 849.

3 *Schweiz. med. Wschr.* 1955, **85**, 222.

4 *Tubercle* 1955, 36, 209.

5 *Lancet*, 1955, 1, 116.

dosage

Therapas may be administered in daily doses of 14 G.

availability

Individual packets of 3.5 G. in boxes of 100 packets.
1 G. cachets in containers of 100 and 500.
Bulk Therapas powder in containers of 100 G. and 500 G.

S&N

Further information and prices from
Smith & Nephew Ltd.,
Welwyn Garden City, Herts.

to summarize

a
THERAPAS is just as effective as P.A.S., if not more so.

b
It is better tolerated.

c
And it can be used wherever P.A.S. is indicated.

Aspirin intolerance in rheumatoid arthritis

BUFFERIN—the new, better-tolerated analgesic

Most successful answer yet discovered. The latest report by the Joint Council Committee of the Medical Research Council and the Nuffield Foundation (on clinical trials of cortisone, ACTH, and other therapeutic measures in chronic rheumatic diseases) confirms the findings of the previous year. "At the end of two years, therefore, as previously reported at the end of one year, it appears that for practical purposes there is remarkably little to choose between cortisone and aspirin in the management of this group of patients." (British Medical Journal, 1955, *2*, 695.)

As aspirin is a far cheaper and less dangerous therapeutic agent it is obvious why practitioners prefer it to cortisone. But there is still the problem of aspirin intolerance which affects as many as 42% of arthritic patients. And Bufferin, the new analgesic which reduces gastric upset to a negligible minimum, is certainly the most successful answer yet discovered. (J.A.M.A., June 4, 1955, p. 387.)

Far better tolerated—even by arthritics. Bufferin combines acetylsalicylic acid with the antacids aluminium glycinate and magnesium carbonate (gentle antacid agents which do not produce "acid rebound"), and is well tolerated—even by arthritics. In blind trials amongst arthritics with proven intolerance to ordinary aspirin, 70% had no gastric symptoms after taking large doses of Bufferin over periods of 4 to 16 months. (J.A.M.A., June 4, 1955, p. 387.)

Acts twice as quickly as aspirin. Not only is Bufferin better tolerated by the stomach than ordinary aspirin, but its pain-relieving ingredient is absorbed twice as quickly into the blood-stream. Trials show that on an average the 10-minute salicylate level after taking Bufferin was more than 20% higher than the 20-minute level after taking ordinary aspirin (J. Amer. Pharm. Assoc. 1950, 39:21.)

BUFFERIN HAS NO EQUIVALENT IN THE B.P. OR NATIONAL FORMULARY. THIS FULLY JUSTIFIES THE PRESCRIPTION OF BUFFERIN ON E.C.10.

A detailed, fully documented leaflet and sample are available on request to the makers, Bristol-Myers Co. Ltd., Dept. B., 211 Blackfriars Road, London, S.E.1.

BUFFERIN
TRADE MARK
ANTACID ANALGESIC

Formula: *Acetylsalicylic Acid 5 gr. : Aluminium Glycinate ½ gr. : Magnesium Carbonate 1½ gr*

In two years Becantyl has become an established treatment for useless cough–

Especially with

children and old people,

No side-effects

Unrelated to morphine derivatives or guaiacol and with none of their disadvantages, Becantyl suppresses useless cough. The active ingredient in Becantyl is Sodium-2 : 6-ditertiarybutylnaphthalene monosulphonate. This chemical, which does not cause constipation, anorexia, drowsiness or other side-effects, is the result of original research.

These characteristics make Becantyl especially valuable for the treatment of useless cough in children and old people.

Becantyl is available in 4 fluid-ounce bottles, and also in 40 fluid-ounce and 80 fluid-ounce dispensing bottles.

The suggested doses are:—

Adults: 2 teaspoonfuls

Children: 3—6 years: ½ teaspoonful

7—15 years: ½—1 teaspoonful

three times a day or as prescribed.

Becantyl has no B.P. or N.F. equivalent, is not advertised to the public, and may be prescribed on form E.C.10.

BECANTYL

Literature and Samples available from the Medical Information Department

Horlicks Limited, Pharmaceutical Division, Slough, Bucks

BIBLIOGRAPHY

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Contribution a l'étude pharmacologique et toxicologique du butylnaphtalène sulfonate sodique ou L.1633. *Arch. Internat. Pharmacodyn*, 1954, **97**, 34

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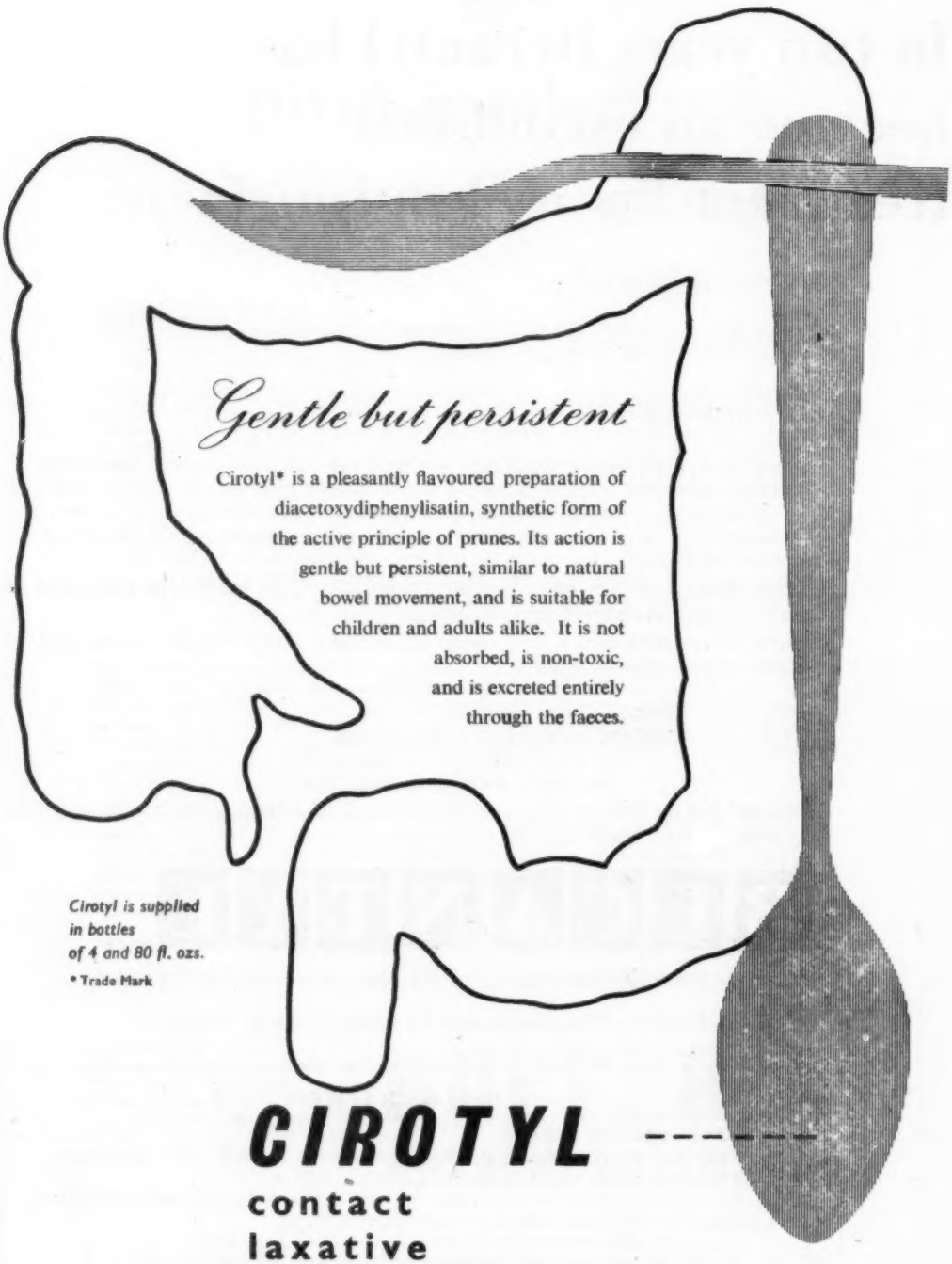

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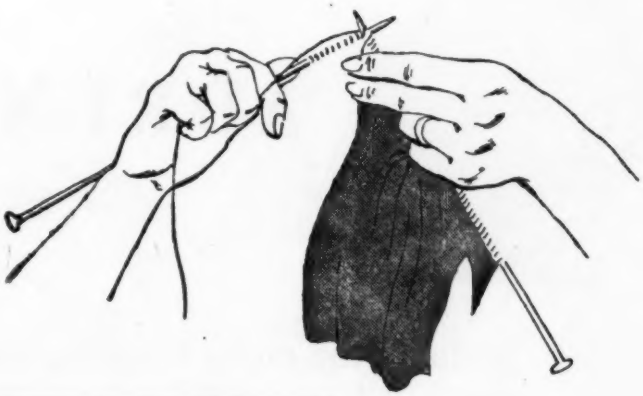

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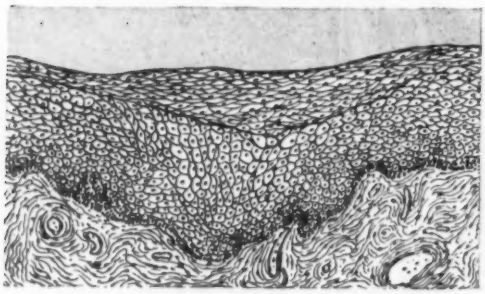
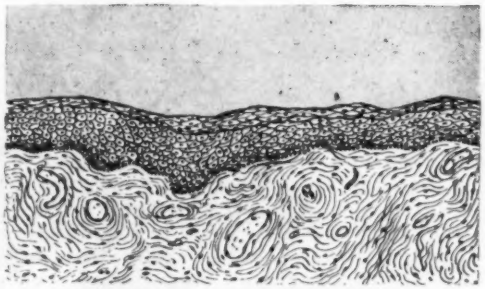
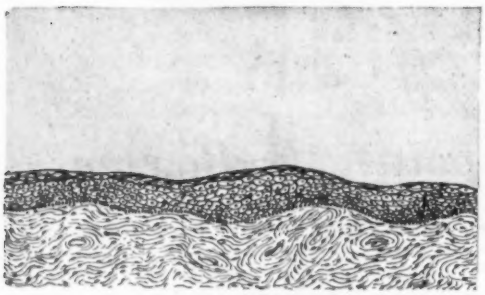


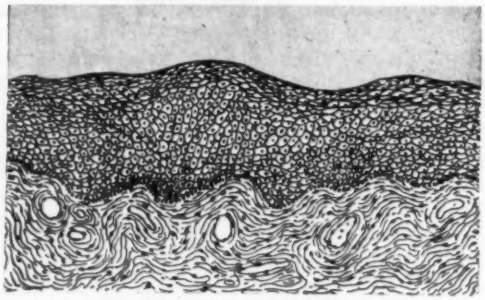
Adult vaginal epithelium maintained by natural œstrogenic activity.



At menopause: reversion of epithelium towards the infantile type.



Post-menopausal, infantile type of epithelium, with thin, atrophic layers.



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†New England J. Med. *247* : 829 (Nov. 27) 1952

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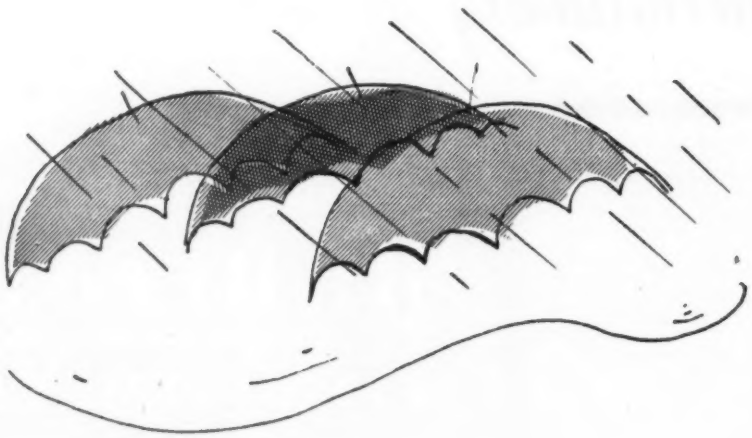

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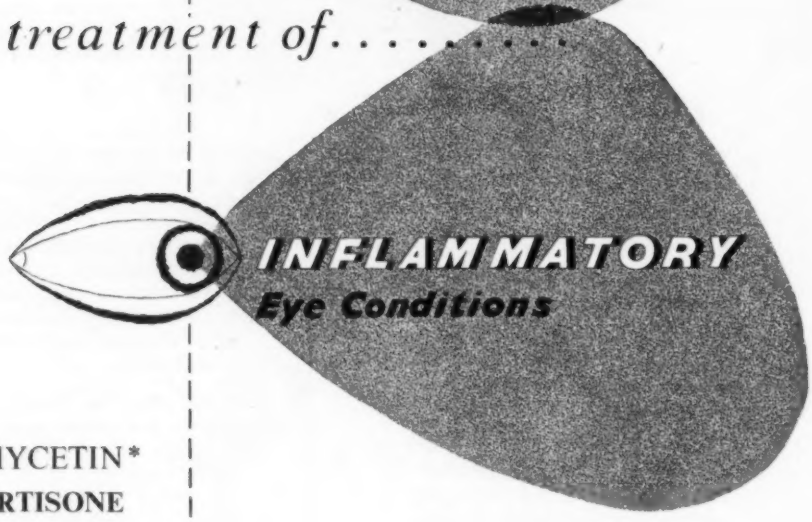

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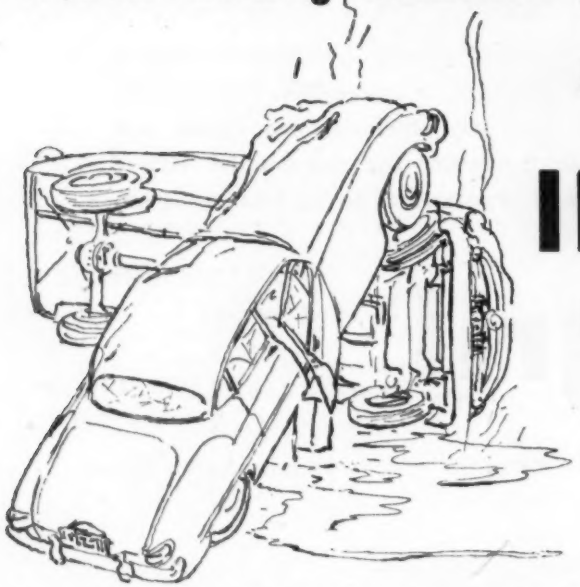

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MYOPATHY IN SHEEP

ITS RELATIONSHIP TO SCRAPIE AND TO DERMATOMYOSITIS AND MUSCULAR DYSTROPHY

FRANCES D. BOSANQUET
M.B. Lond.
NEUROPATHOLOGIST, WEST END HOSPITAL FOR NEUROLOGY AND NEUROSURGERY AND MAIDA VALE HOSPITAL FOR NERVOUS DISEASES, LONDON

P. M. DANIEL
M.A. Camb , D.M. Oxfd, M.R.C.P.
SENIOR RESEARCH OFFICER AND CONSULTANT PATHOLOGIST, DEPARTMENT OF PATHOLOGY, RADCLIFFE INFIRMARY, OXFORD

H. B. PARRY
M.A. Camb., M.R.C.V.S.
OF THE NUFFIELD INSTITUTE FOR MEDICAL RESEARCH, UNIVERSITY OF OXFORD

With illustrations on plate

THIS paper describes a hitherto unrecorded spontaneous degeneration of skeletal muscle (myopathy) in adult sheep, which in many ways resembles the diseases of dermatomyositis and muscular dystrophy in man. We use the term "myopathy" to mean a pathological degeneration of muscle of unknown cause.

Most of the affected sheep have been suffering from scrapie, and the myopathy accounts for many of the clinical features of this disease. In addition the myopathy has been found in two other clinical syndromes, which have not been previously recorded.

Scrapie has been recognised in European sheep for some 200 years, being called *Traubenkrankheit* in Germany and *la tremblante* in France. It is a chronic wasting disease confined to sheep and is said to be always fatal. Its ætiology and pathogenesis have been in active dispute for over a century (see Greig 1940). The failure of previous workers to recognise the presence of muscular lesions may be attributed to their preoccupation in recent years with the idea that scrapie was due to a transmissible agent affecting the central nervous system, and to the fact that the skeletal muscles are very seldom examined thoroughly at necropsy.

Scrapie and related myopathies are widespread in sheep in Britain, and are of very considerable economic importance. In some parts they are the largest single cause of loss in sheep, and they have been responsible for a substantial decline in the numbers of breeding sheep kept in certain areas. Scrapie is also the cause of recent restrictions on the international trade in sheep.

Materials and Methods

This account is based on the study of 439 sheep affected with myopathy. 45 of these were studied fully, both clinically and pathologically, and the necropsy included dissecting out all the skeletal muscles to determine how severe and extensive the myopathy was. As controls 15 unaffected sheep were studied in the same way.

The affected sheep came from twenty-five different flocks widely scattered over twelve counties in Britain and were of four pure breeds and one cross-breed. The unaffected group were of three other pure breeds and one cross-breed.

Some of the myopathic sheep came from commercial flocks, but many were from very carefully shepherded pedigree flocks which are members of a pedigree-sheep health scheme.

In the thirty odd flocks in this scheme, containing about 5000 breeding females, special steps are taken to ensure individual identification of all animals from birth with correct details of parentage. Records are kept of all cases of ill health, disability, and death. The sheep are visited and their records are checked by one of us (H. B. P.) at least twice a year. These flocks are self-contained except for the introduction of new sires from time to time, and form isolated communities free from most of the infectious diseases to which sheep are liable.

About half of the female progeny are retained as breeding replacements in their own flocks, and the less desirable animals, usually those born late, ill-grown, or with certain undesirable breed points, are slaughtered before the age of 18 months. The average breeding ewe remains in the flock until she has had at least three or four crops of lambs—i.e., is aged 5 years or more—but exceptionally a ewe may be retained to the age of 10–12 years. The male progeny in these flocks are sold for breeding before they are 21 months old, and it is difficult to follow the subsequent career of more than a very few which go as stud rams into other flocks in the health scheme. These stud rams may be retained until the age of 5 years or more, but many are not kept after the age of 3 years. Thus many more females are under observation than males, and the females are watched until they are much older.

The sheep are mainly kept in folds on arable crops and are well fed, especially during adolescence. The farms are on a wide variety of soils, but most of the affected flocks are on the lighter soils of sandy nature or overlying chalk with an annual rainfall of less than 25 inches.

Clinical Observations

For recognition of the earliest signs of the myopathy we relied on experienced shepherds. As soon as the shepherd noticed their illness the sheep were brought into hospital for observation for periods varying from a few days to six months. They were fed liberally on good-quality hay, roots, and an excellent balanced ration of concentrates high in good quality protein, with water ad lib.

Necropsy

Some sheep died of their disease, but most of them were killed, usually by the rapid injection of an overdose of sodium pentobarbitone into the jugular vein.

The necropsy was begun at once and was completed usually within twelve hours and always within thirty-six hours. Special care was taken to prevent struggling and violent movements just before death. The endocrine glands, the thoracic and abdominal viscera, and the central nervous system were dissected out first, examined, and weighed, and material from them for histological examination was placed in fixative within one to two hours of death. The skeletal muscles were usually left to "set" for three or four hours—i.e., until early rigor mortis had passed off—to minimise the shortening and distortion which take place when specimens are excised too soon after death. All the skeletal muscles were dissected out. The carcase flesh—i.e., muscle, fat, and fascial tissues—was weighed separately from the cleaned bony skeleton, and the ratio of flesh to bone was computed as a general measure of the extent of the muscular wasting; in a normal non-pregnant sheep in a good state of nutrition this ratio exceeds 3 : 1.

Histological Examination

The tissues were fixed in 10% formol-saline solution, formol-mercuric-chloride solution, Bouin's fluid, and Zenker's fluid.

Those fixed in mercurial fixatives were washed after 24 hours and stored in 10% formol-saline solution. To avoid distortion pieces of muscle and nerve were laid on dry cardboard before being placed in the fixative. Frozen sections were cut and stained with Sudan IV and by the Marchi method. Blocks embedded in either paraffin or low-viscosity nitrocellulose were cut, and the sections were stained with Ehrlich's hæmatoxylin and eosin, iron hæmatoxylin, and van Gieson's mixture, Mallory's phosphotungstic-acid hæmatoxylin, and Masson's trichrome method. Sections of the nervous system were also stained by Nissl's method and by Weil's method for myelin. Holmes's method for nerve-fibres was also used.

The material was not examined fully, and we report here only the principal positive findings.

Findings

MORBID ANATOMY

Muscles

The outstanding lesions are a degeneration of the skeletal muscles, which may show itself as enlargement and extreme pallor of whole muscles (fig. 1); as small foci of pallor widely disseminated (figs. 5 and 9); as generalised wasting of skeletal muscle, with changes of texture in the muscles, which come to resemble fish-flesh and are translucent; or as an unusual firmness of the muscles without wasting. These various forms of muscle change may be found in the same animal, and the lesions are astonishingly widely scattered. They tend to be symmetrical, but occasionally the muscle on one side of the body is much more severely affected than that on the opposite side.

The pale muscles or foci are soft and rather putty-like. The palest areas may be slightly swollen and stand up above the surrounding muscle, but this is not invariable. Affected muscle occasionally has a flecked appearance like a thrush's breast. There is a generalised wasting of the skeletal muscles, which are somewhat paler than normal and translucent, rather like those of fish. Such muscles are more flabby than usual, and rarely show pronounced rigor mortis. Individual muscles may be reduced to half their usual weight. In severely wasted animals the flesh/bone ratio is usually less than 1·5 : 1·0 instead of the normal 3 : 1; often the small ventral neck muscles are reduced to mere ribbons about 1 mm. thick. Associated with the muscle wasting is an almost total absence of subcutaneous, intermuscular, intra-abdominal, and perinephric fat; the fascial tissues appear glistening and moist. Less frequently certain muscles, notably the sternomastoids, are firmer and slightly enlarged, rose-pink, and not translucent. On the other hand, in a few cases there is excessive accumulation of subcutaneous, intermuscular, and even intramuscular fat, which is more greasy than normal mutton fat at 55–70°F.

The distribution of the most striking muscle lesions varies very much. Some muscles, such as the iliopsoas, the facial and auricular muscles, the external eye muscles, and the muscles of the larynx, pharynx, and tongue, may be extremely atrophic. Thus sheep which had great difficulty in raising their heads had severe lesions of some of the dorsal neck muscles; those with faulty eye movements had severe lesions of the extrinsic ocular muscles; those with gross ataxia of the hind limbs had severe lesions in the muscles of the thigh and the pelvic girdle, where often the semitendinosus and semimembranosus muscles were involved (fig. 9); those with unusual movements of the fore limbs had lesions of the muscles of the shoulder girdle, especially the lateral head of the deltoid, the coracobrachialis, and the teres major muscles; those with acute palsy of the hind limbs had the most severe lesions in the anterior tibial muscles (fig. 4); those with drooping ears had wasting of the auricular muscles; and so forth. Disseminated focal lesions may be found in most muscles, but they are often inconspicuous unless a thorough search is made. The diaphragm is affected occasionally.

Foci of slight pallor occur in the myocardium in about a third of the cases, most commonly in the papillary muscles. The heart weight is probably within normal limits. The muscle of the œsophageal groove is often much reduced. The tongue may be very flabby.

Skin

The skin usually shows lesions both of the wooled and haired portions. In the dark-haired breeds there is often some lightening of the colour of the hair, with small papillary eruptions which have a firm core over which the hairs are missing. These are common on the bridge of the nose and on the legs. Not infrequently the integument over the dorsal nasal bones is swollen and œdematous, with small dry scabs over the papules. The fleeced portions of the skin have shown no obvious lesions, even where the wool has been broken by rubbing, except over the ischial tuberosities, where the skin is often very firmly attached to the underlying subcutis. In general, when the hide is removed it does not strip so easily as in normal sheep, and the exposed tissues are unusually dry and hot.

Other Organs

The adrenal glands are invariably enlarged to two or three times their normal size in the later stages of the disease. There are no conspicuous changes in the other endocrine glands, but the thyroids tend to be small and rather paler than usual. Occasionally the lymph-nodes, particularly of the neck and limbs, are enlarged.

No other macroscopic lesions were constantly present in the abdominal organs, the circulatory, respiratory, and lymphatic systems, the brain, the spinal cord, or the peripheral nerves. We radiographed the femurs of normal and of myopathic sheep and did not detect any difference in the densities of the bones of these two groups.

HISTOLOGY

Muscle

Sections through macroscopically affected muscles—i.e., through pale areas of muscle—show profound degeneration (figs. 2, 10*b*, 11, and 16–18). The skeletal muscle of normal sheep is not unlike human skeletal muscle (see figs. 6, 10*a*, and 12). However, in the pale areas there is a great loss of muscle-fibres, with a remarkable increase in the number of nuclei (figs. 2, 8, and 17). In some fields hardly a muscle-fibre is left intact (fig. 14). In transverse sections the muscle-fibres are round instead of polygonal and are very uneven in size, many being much smaller than usual (down to 5 μ in diameter) while others are larger than normal (up to 120 μ in diameter), the normal according to Hammond (1932) being 20–60 μ in the same breeds of sheep. The sarcolemmal nuclei are often much more numerous, rounder, and more vesicular than normal. They are often central, or all that remains of a muscle-fibre may be a chain of nuclei in a sarcolemmal sheath (fig. 8). Characteristically, short lengths of individual muscle-fibres are fragmented and cellular (figs. 3 and 20). The sarcoplasm may be hyaline, basophilic, or granular. Sometimes there are large collections of nuclei in the centre of a fibre, which is usually swollen (fig. 13). Elsewhere syncytial masses of rather basophilic sarcoplasm containing many rounded nuclei and occasionally vacuoles are seen (fig. 7). If whole areas of muscle are affected (fig. 10*b*), there is no pattern of fascicular degeneration such as is seen in a degeneration of muscle secondary to a peripheral-nerve or anterior-horn lesion, and the muscle nerves so far examined have shown no degeneration. The pattern is one of random muscle-fibre degeneration characteristic of an intrinsic or primary lesion of muscle. Sometimes single muscle-fibres are diseased, lying among healthy ones in apparently normal muscles, and characteristically often only parts of muscle-fibres are affected. In some of the less affected muscles very long rows of central or of subsarcolemmal nuclei are found, and here the picture is much like that of myotonic dystrophy in man. Sometimes hyaline and granular degeneration of muscle-fibres, with little increase in nuclei, is seen.

Apart from the degenerative changes in the muscle-fibres there is usually no perivascular cuffing and relatively little interstitial infiltration of cells (fig. 19). The nuclei appear to be abnormal sarcolemmal nuclei, but very many are of unknown origin (figs. 15 and 16).

In occasional muscles there are scattered polymorphonuclear cells, some of which are eosinophils, but there are no accumulations suggesting inflammation. (We have seen two cases of acute inflammation of muscle in sheep,

which showed a very different histological picture.) On the whole the interstitial collagen is not much increased, but occasionally we have seen areas where rounded muscle-fibres of various sizes were embedded in collagen; and in some muscles an increase in interstitial fat may be seen (fig. 21). Both of these findings are common in the chronic lesions of human muscular dystrophies.

A remarkable fact is that the myopathic area is often so well circumscribed and that normal or almost normal muscle may be found close to badly degenerated areas, corresponding to the foci of pallor seen macroscopically (figs. 1, 4, 5, and 9), though numerous areas which are microscopically affected may be found in muscles which look macroscopically normal. If enough blocks from various muscles of any one myopathic sheep are examined, almost every form of the degenerations described will be found in some section.

Many of the lesions appear to us to be similar to, if not identical with, those seen in human polymyositis.

All the muscles we have examined, from both normal and myopathic sheep, have been infected with sarcocysts (limb muscles, tongue, extrinsic eye-muscles, and heart, including the Purkinje fibres). There is no cellular response to the presence of the sarcocysts, and we agree that there is no reason to implicate this universal parasite of sheep in the genesis of scrapie (M'Fadyean 1918, Brownlee 1940).

In examining the myopathic muscles of these sheep we have seen examples of most of the artefacts commonly seen in histological preparations of muscles.

In addition we have seen *Ringbinden* around the muscle-fibres of both normal and myopathic sheep. We have seen them in normal human muscles at all ages and do not regard them as pathological features (see Daniel 1946).

Abnormalities in Muscle Spindles

The normal muscle spindle in the sheep, as in other mammals, is composed of small muscle-fibres (intrafusal muscle-fibres) with very clear cross-striations enclosed within a fibrous-tissue capsule and with a very rich innervation. The intrafusal muscle-fibres have in their mid-part or equatorial region a bag of very large vesicular nuclei and, adjacent to this, a number of large central nuclei, forming the so-called myotube region. Some details of muscle spindles in the eye muscles and in the limb muscles are given by Cooper and Daniel (1949, 1956) and Cooper, Daniel, and Whitteridge (1951, 1955).

In these myopathies of sheep the muscle spindles in the severely affected limb-muscles and in the extrinsic eye-muscles (the recti, obliques, and retractor bulbi) showed degenerative changes similar to those seen in the extrafusal muscle-fibres. Some of the intrafusal muscle-fibres showed loss of cross-striation, some showed granular degeneration, and some vacuolation. The nuclei of the extremities of these intrafusal muscle-fibres—i.e., in the region of the poles—were rounder than normal and in places were in rows. Those in rows stained more deeply and were plumper than usual. The nuclei of the myotube region and of the nuclear-bag region were much smaller and more darkly staining than normal, and instead of being vesicular they were filled with chromatin. We have not yet studied the changes, if any, in the innervation of the affected muscle-spindles.

Nervous System

Our examination of the nervous system of these sheep has not been completed, but we found no obvious loss of anterior-horn cells in the spinal cord, such as would be found in a motor-neurone disease. Nor have we seen any inclusion bodies or foci of nerve-cell degeneration or of perivascular cuffing which would indicate a virus infection of the central nervous system. The occasional vacuoles found in the large cells of the medulla and rarely in the anterior-horn cells of the spinal cord (which have aroused so much interest in all workers on scrapie) are, we believe, of little significance, because we have seen them in the nerve-cells of normal sheep and of humans affected by various diseases.

Skin

The skin lesions showed a non-specific increase of cells in the dermis but no obvious abnormality of the collagen. A full study has not yet been made of these skin lesions nor of the other organs.

PRINCIPAL CLINICAL FEATURES

Sheep affected with myopathy show a wide variety of clinical signs, which give rise to a bewildering number of syndromes, with many intermediate forms. Many of these animals undoubtedly have scrapie. They show a progressive loss of power of the skeletal musculature, usually with marked loss of muscle mass and a disturbance of gait and posture which can be closely correlated with the muscles most severely affected by the myopathy. There is no conspicuous loss of reflexes. Many animals rub themselves or scratch with their hind legs without signs of any of the usual causes of skin irritation, and some have a rash with a papular eruption of the haired skin. Scrapie is usually slowly progressive and fatal, but we suspect that occasional cases may become stationary and even regress.

Myopathy affects sheep $2^1/_2$ to $3^1/_2$ years old—i.e., in early middle age—by far the most often, but it is seen occasionally at 15 months, and has been observed at the age of 8. Both males and females suffer from the disease, most cases developing during the winter months. The majority of cases occur in breeding ewes during their second pregnancy, the disease usually appearing in a mild form during the latter half of pregnancy and becoming manifest at parturition or shortly after.

In the typical case the onset of the disease is extremely insidious and very difficult to detect clinically, because the first signs appear at irregular intervals, and on casual inspection the sheep looks perfectly normal. Affected animals become fatigued unusually quickly when driven, and may collapse as they walk, recovering after a short rest. At intervals they will stand and stare with the head raised slightly. The wool develops a harsh texture with a whitish dead-looking tip to the fleece. Later the gait becomes slightly unsteady, particularly if the animal is forced to turn quickly. After three or four weeks the sheep begins to rub itself against hard objects, the common sites of rubbing being the poll of the head between the ears, and the buttocks on each side of the base of the tail, or it may scratch with its hind legs just in front of the shoulder-joint or behind the elbow.

Some two months from the onset, frank signs of the disease are manifest. The animal is unthrifty—i.e., is not carrying so much flesh as normal sheep in a similar environment, and its fleece and hair look dull and lustreless. There may even be some wasting of the skeletal muscles. The animals fatigue quickly when driven, and 500 yards is about their limit for slow walking. Their gait is ataxic, with excessive flexion of the fore limbs and of the hind limbs, which tend to be kept as far apart as possible, giving the animal a wide-based stance. The head is held up with the nose in the air. The ataxia is accentuated if the sheep is hustled, since it becomes excited and upset much more readily than a normal animal. The signs of rubbing are clear-cut; the original wool over the rubbed parts is shed and replaced with a new short growth. The sheep nibble at the haired skin below the knee and hock, scratch like a dog with fleas, and often rub the bridge of the nose. Over the haired parts of the skin a rash appears with papular eruptions. The papules become capped with a serous exudate, which hardens and is shed, leaving a small firm pimple from the surface of which the hair is shed and does not regrow.

The appetite is still good, and a limited series of observations on the intake of food indicates that these sheep probably eat enough food to keep them in good health if they were normal.

Three or four months after the development of the first signs the florid stage of the disease develops, which ends fatally in from two to four weeks. The sheep waste away until they appear to have very little flesh and the muscles are small and flabby. The sheep lie about a great deal and cannot walk more than 50 yards at a time. They are now extremely difficult to handle because they cannot be driven like normal sheep, and they become very confused by any change in their routine of living. Their gait is extremely unsteady and they

PRINCIPAL SYNDROMES OF MYOPATHY IN SHEEP

Type	No. of cases seen	Necropsy findings		Clinical signs	Syndrome
		No. examined	Principal lesions		
1	313	26	Pallor of whole muscles or foci of pallor widely disseminated; moderate muscular atrophy. Myopathy	Rubbing; severe ataxia and weakness. Lesions of skin. Fatal	Classical scrapie
2	6	2	Atrophy of skeletal muscle with pale foci as in 1, but much fat in subcutaneous tissues and muscles. Myopathy	Rubbing; weakness without wasting, ataxia and lesions of skin. Fatal	Non-wasting scrapie
3	28	6	Very marked atrophy of skeletal muscles with fish-flesh texture. Occasional firm lesions, but foci of pallor inconspicuous. Myopathy. Histological lesions similar to those in 1 and 2	Rubbing; marked wasting without marked ataxia. Lesions of skin. Fatal	Pining scrapie
4	5	5	Occasional striking foci of muscle pallor anywhere. Myopathy. Histological lesions as in 1 and 2	No rubbing; slight wasting only, without serious ill health. Probably eventually fatal	Preclinical scrapie; inapparent myopathy
5	14	4	Severe degeneration of anterior tibial muscles. Some foci of myopathy elsewhere. Histological lesions as in 1 and 2	No rubbing; rapid onset of great weakness of hind legs. Fatal	Hind-limb palsy (closely related to scrapie)
6	73	2	Very marked atrophy of whole skeletal musculature. Histological lesions similar to those in 1 and 2	No rubbing; severe wasting, usually with recovery, in late pregnancy and during lactation	Postpartum pining

fall over if they attempt to turn sharply. Frequently they try to advance at a sort of clumsy gallop, moving the two hind limbs together, because they lose their balance with only one leg on the ground. The patellar, Achilles, triceps, biceps, and plantar reflexes of the limb muscles are usually present though they may be weak, but the muscles on which these reflexes depend are seldom severely affected. At rest the affected sheep adopt normal body postures, and after a fall they regain their usual posture, although in a clumsy manner.

In the terminal stage the sheep cannot rise to their feet, but, housed indoors, they may live for upwards of a week lying on their sides. They now often show hypertonicity of the limbs, which become very difficult to flex. Such recumbent animals may eat if food is brought to them, but they are usually incapable of doing so. They can swallow if fed artificially. The invariable end of this stage is death; in the field, animals are merely found dead after a cold wet night.

The disease usually lasts four to six months, occasionally a shorter time, rarely longer, and no form of therapy is known which significantly affects its course or duration.

Abnormal neurological signs are rarely seen.

The postural and tendon reflexes are present. Response to pinprick of the integument is normal; sometimes there seem to be some ill-defined areas of hypoæsthesia, but no constant disturbance of cutaneous sensation has been found. The ataxia is little altered by blindfolding. Firm pressure with fingers over the buttocks and base of the tail, dorsal lumbar region, and elsewhere elicits a nibbling response. This response consists in slight raising of the head and nose (with obvious concentration of the animal's attention), nibbling movements of the lips with extrusion of the tongue, and smacking of the lips—the whole attitude suggesting considerable satisfaction to the sheep. It is difficult to elicit this response by light touch of the skin over rubbed areas, but it may be readily elicited by deep muscle pressure and is abolished by the infiltration of a local anæsthetic agent. Defæcation and micturition are normal; the eye-preservation and pupillary light-reflexes, hearing, and deglutition are normal.

The stools appear normal. The appetite is usually good until the end, but an occasional sheep appears to lose its appetite in the last stages.

The disease does not seem to interfere with normal reproduction in the female until the loss of muscle power seriously interferes with her activities. Normal lambs are carried to term, parturition is normal, and lactation is usually uneventful, with a good milk-flow as judged by the growth of the lambs. Occasionally, when parturition coincides with an early stage of the clinical disease, the mothering behaviour is lost: the ewe becomes confused and refuses to have anything to do with her lambs. Males are active and fully fertile within two months of the onset of the clinical illness.

Certain variations of this clinical pattern are not uncommon.

Thus there may be different presenting signs. A sheep may suddenly refuse to be driven or respond to a sheepdog, as if temporarily confused and aggressive; modest but definite swellings of the muzzle and face appear and then subside; sudden swellings of the ears develop, due probably to hæmatomata, which heal, leaving a typical "cauliflower" ear; in many cases the ears flap unduly when the sheep is walking; the eye movements are jerky, and the animals have an unusual "fixed" stare (in these, severe myopathy of the extrinsic eye-muscles is found at necropsy). In a few cases the gait has been stiff and hypertonic, resembling that seen in myotonic dystrophy in man. In the later stages the soft tissues of the bridge of the nose are not infrequently swollen; occasionally signs of disturbance of alimentary motility occur, with recurrent ruminal tympany; a few sheep show profound

LEGENDS TO ILLUSTRATIONS ON PLATE

DR. BOSANQUET AND OTHERS

Fig. 1—Lateral aspect of hind leg of sheep with scrapie. Short head of biceps femoris (dark) is unaffected, whereas long head (on right) and semitendinosus and semimembranosus muscles are very pale, being severely affected by myopathy.

Fig. 2—Longitudinal section from severely affected skeletal muscle shown in fig. 5, showing two muscle-fibres still retaining cross-striation, with atrophic and degenerated muscle-fibres between them. Note great increase in cellularity of this area. (Iron hæmatoxylin and van Gieson. × 216.)

Fig. 3—Longitudinal section of extrinsic eye muscle showing single degenerating muscle-fibre. (Iron hæmatoxylin and van Gieson. × 460.)

Fig. 4—Lateral aspect of lower hind leg of sheep with myopathic palsy of hind limbs, showing (on right) incised pale myopathic anterior tibial muscle and (on left) normal dark digital flexors.

Fig. 5—Sharply demarcated focus of intense pallor (arrows) due to myopathy in teres major muscle of sheep with scrapie.

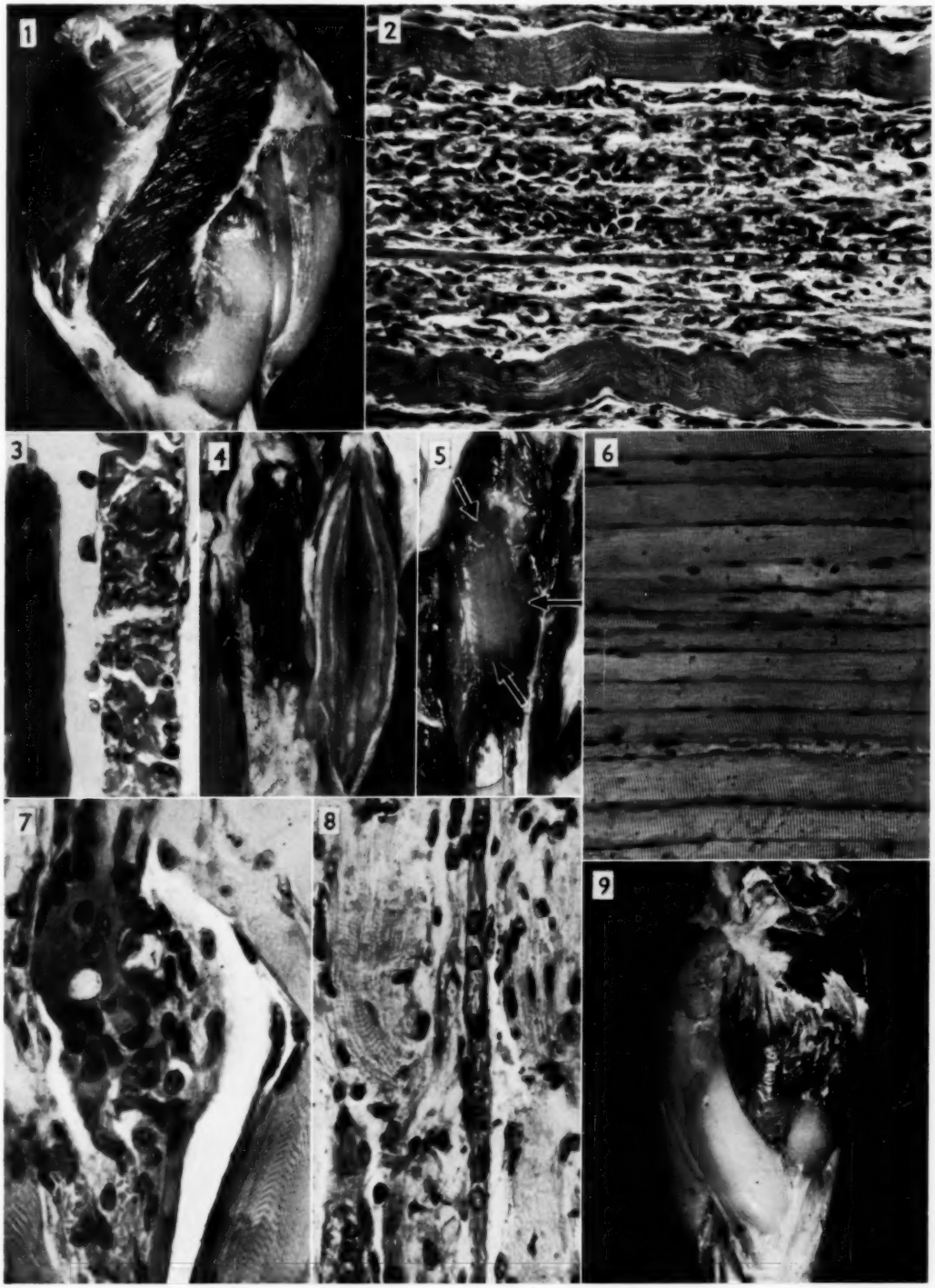
Fig. 6—Longitudinal section of normal sheep skeletal muscle. (Iron hæmatoxylin and van Gieson. × 216.)

Fig. 7—Affected muscle. Syncytial mass of hyaline basophilic sarcoplasm containing numerous large nuclei and two vacuoles. (Hæmatoxylin and eosin. × 570.)

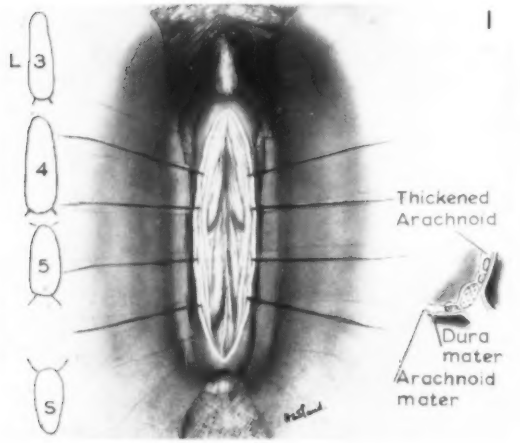
Fig. 8—Longitudinal section of affected skeletal muscle showing one very shrunken muscle-fibre and increase in nuclei. (Hæmatoxylin and eosin. × 415.)

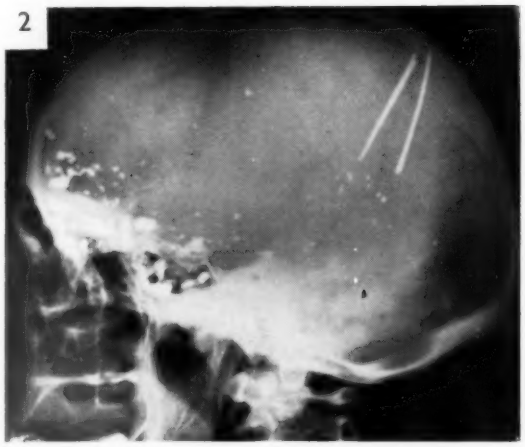
Fig. 9—Posterior aspect of hind leg of sheep with scrapie. The prominent very pale muscle on left showing some pseudohypertrophy is the semimembranosus, which is affected by myopathy throughout its length. Near insertion of gracilis (on right) is a small pale focus of myopathy. Note dark colour of unaffected muscle.

DR. BOSANQUET, DR. DANIEL, AND MR. PARRY: MYOPATHY IN SHEEP

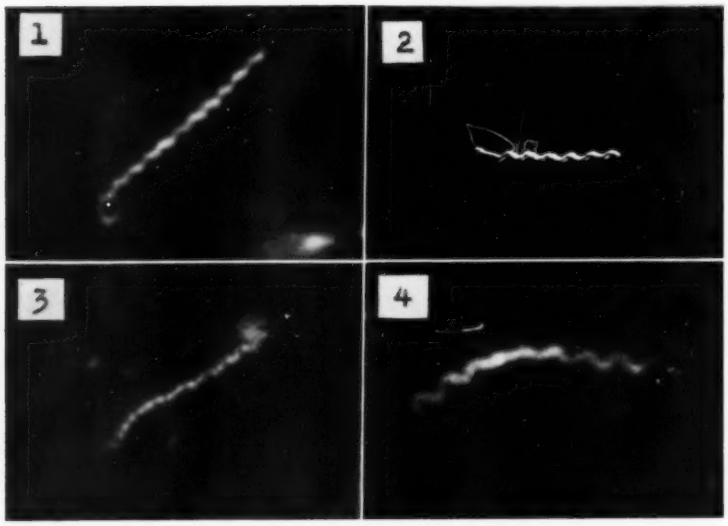


MR. DAVIES: UNABSORBED CONTRAST MEDIA

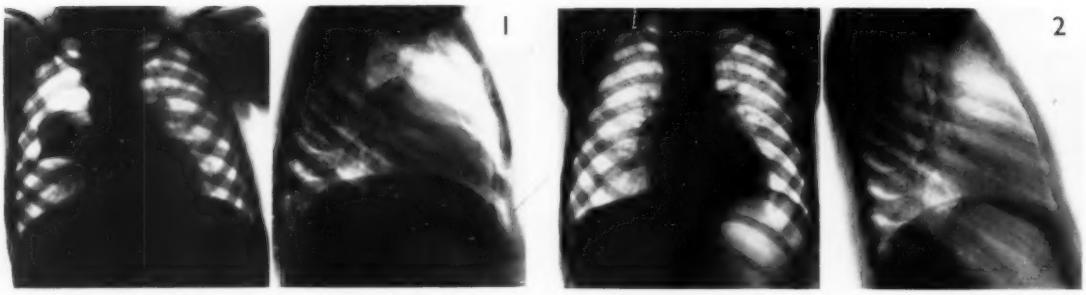




DR. SEQUEIRA: TREPONEMA PALLIDUM



DR. McMATH: PNEUMOTHORAX AFTER TRACHEOTOMY



weakness of the dorsal neck muscles, so that they rest their jaw on the ground and they cannot raise their heads off the ground for more than two or three minutes.

Most of our myopathic sheep conformed to this clinical syndrome, which is identical with classical descriptions of scrapie, but there were also several other clinically distinct syndromes in which myopathy also appeared to be the prime lesion. These are summarised in the table. Thus in type-3 syndrome muscle-wasting is profound but there is little ataxia. In type-2 syndrome the sheep does not waste at all and indeed may increase in weight considerably and be fat when it dies. In type-4 syndrome only vague signs of unthriftiness have been noted and the sheep have not been observed to rub; but several of them had parents affected with scrapie, and they themselves had not reached the age at which clinical signs of scrapie usually appear. These four types may be considered to be part of the scrapie complex.

Hind-limb palsy (type 5) and postpartum pining (type 6) have not been described before. Postpartum pining is very similar to type-3 syndrome, occurring mostly just after lambing; but rubbing is absent, and only a weak nibbling response can be elicited. Many of these sheep recovered.

Hind-limb palsy is a very characteristic acute syndrome in which the hind limbs suddenly become weak just before or just after parturition; it progresses so rapidly that within ten to fourteen days the animal cannot rise on its hind limbs; its tendon-reflexes are still present but weak. Movement of the fore part of the body is virtually unaffected; hence the sheep sit up on their haunches like a dog. Although the sheep with hind-limb palsy do not have skin lesions or rub, we regard this fulminating myopathy as being closely related to scrapie.

PREVALENCE

No reliable information is available about the general prevalence of this group of myopathic diseases, and the sample of flocks considered in this paper should not be considered representative of British sheep. Many of the flocks are completely free of the disease; some have an attack-rate of 1–2% per annum among the breeding ewes, and in these flocks the different types of myopathy tend to occur alone in successive years. Occasionally the attack-rate reaches 10% per annum, and in one commercial flock 25% of 105 breeding ewes were lost during a single year. In certain areas the disease is the principal cause of loss in breeding flocks and can be of such economic importance that it determines whether the breeding flock is retained or not.

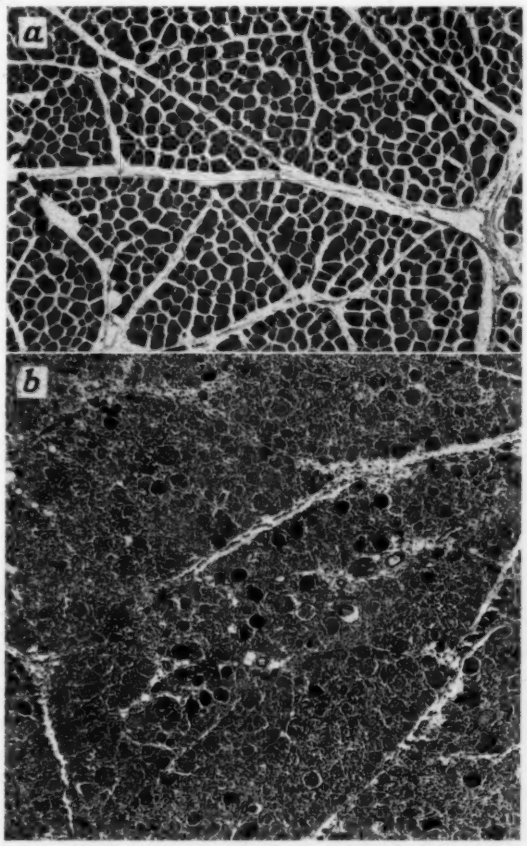


Fig. 10—Transverse section of (a) normal and (b) affected skeletal muscle. Note in (b) complete loss of normal pattern, and rounding of muscle-fibres. (Iron hæmatoxylin and van Gieson. × 46.)

Myopathy occurs in sheep of certain family strains of certain breeds. Other strains of the same breed may be quite free; and, if liable and non-liable strains are brought together in the same flock and mated by the same rams, members of the non-liable strain remain free from myopathy. The introduction of an animal which becomes myopathic into a flock apparently free from myopathy is not necessarily followed by other cases of the disease, provided the progeny of the affected sheep are removed. Sheep with one affected parent are not always affected, but those with two affected parents probably nearly always develop the disease. We have under observation several pairs of non-identical twins in which one member has been affected while the other is still clinically healthy.

Discussion

The discovery of muscle degeneration (myopathy) in sheep with the syndromes described here goes far to explain the principal clinical signs found in these diseases. The correlation between those muscles found at necropsy to be most severely diseased and the defects of gait, movement, and muscle mass presented by the sheep has been very close. Thus sheep with the most severe

LEGENDS TO ILLUSTRATIONS ON PLATE

MR. DAVIES

Fig. 1—Drawing made at operation to show thick white exudate covering nerves and arachnoid three years after injection of myodil.

Fig. 2—Residual myodil in cranial cavity two years after myelography.

Fig. 3—Residual myodil in lumbar theca two years after myelography.

DR. SEQUEIRA

Fig. 1—Typical "spiral" *T. pallidum*. Compare fig. 2 (× 4300).

Fig. 2—Flat wave-form model with lateral illumination. Compare fig. 1.

Fig. 3—*T. pallidum* viewed from one edge. At one end curves are slightly oblique and can be seen; at other end curves lie vertically, each appearing as two dots, producing "pearl-necklace" appearance (× 4300).

Fig. 4—*T. pallidum* twisted about its long axis and showing zone of apparent decrease in width (× 5000).

DR. MCMATH

Fig. 1—Anteroposterior and right lateral views of chest on Oct. 21, 1955, showing massive collapse of whole of right upper lobe, with right-sided pneumothorax and emphysema in mediastinum and both sides of root of neck.

Fig. 2—Anteroposterior and right lateral views of chest on March 12, 1956, showing that collapsed right upper lobe has re-expanded, surgical emphysema has gone, and lung fields are clear. (Radiographs on Oct. 31, 1955, showed same appearances but were technically inferior.)

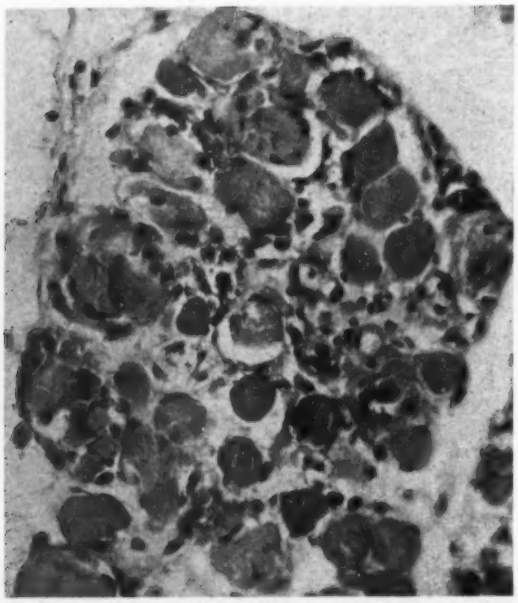


Fig. 11—Transverse section through affected skeletal muscle. Muscle-fibres are rounded and show various stages of degeneration. (Hæmatoxylin and eosin. × 280.)

lesions in their neck muscles have had drooping heads, those with the most severe lesions in the leg muscles have had an unsteady and ataxic gait, those with severe lesions in the extrinsic eye-muscles have had a peculiar fixed gaze, and so forth. The variation in these clinical signs of the disease can be explained largely by the remarkable variety of the muscles which are most affected. On the other hand, there is as yet no satisfactory explanation of the rubbing seen in many cases, nor of the curious changes in behaviour.

However, the discovery of a myopathy as the only clear-cut pathological disorder in sheep with scrapie gives this disease for the first time a satisfactory pathological basis.

We consider that the lesion in the muscles is a primary intrinsic degeneration of the muscle-fibres. There is no evidence that it is secondary to disease of the central nervous system, such as motor-neurone disease, or to peripheral neuritis, or that it is caused by vascular lesions, such as polyarteritis.

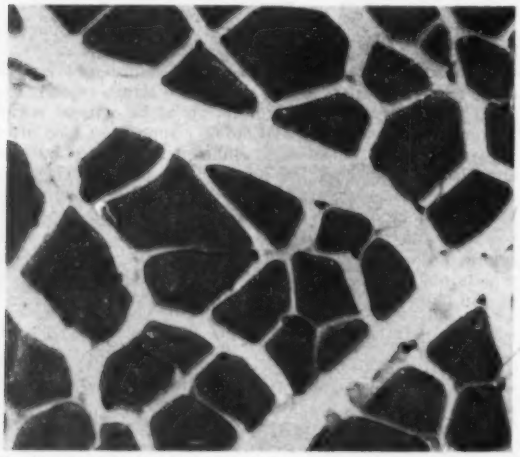


Fig. 12—Transverse section of skeletal muscle of normal sheep. For comparison with figs. 11 and 13. (Iron hæmatoxylin and van Gieson. × 370.)

COMPARISON WITH HUMAN DISEASES

The condition in the muscle appears to be a polymyositis (dermatomyositis). Perivascular infiltration by inflammatory cells is not a striking feature, but this is also so in many human cases of so-called myositis. The inconstant and non-specific skin lesions found in the sheep support this diagnosis. The lesion is not a true inflammation but consists in an acute degeneration of skeletal muscle. This is the case in the human disease (polymyositis) also, where the so-called myositis is not a genuine inflammation. This is generally conceded now, but it was emphasised by Parkes Weber and Gray in 1924, when they half-humorously suggested the term "myososis." We have tried to overcome the difficulty by using the word "myopathy" for a pathological condition of muscle and "polymyositis" only when this human disease has to be distinguished from the muscular dystrophies.

The less severely affected muscles in the sheep show a picture which is the same as that in the more actively degenerating muscles in human muscular dystrophy, and occasionally we have seen muscle-fibres embedded in collagen—a characteristic finding in the more chronic muscular dystrophies. Fat-replacement is present in some of the sheep muscles, but we have not seen it assume the proportions commonly found in the human dystrophies.

We do not, however, suggest that there is too distinct a separation between these various muscular disorders, because it is clear from published reports (e.g., Adams et al. 1953) that there is no sharp distinction between the various conditions. We believe that the histology in both probably portrays only muscle degeneration, more or less acute—muscular dystrophy being a very chronic disease in man, polymyositis a much more acute one.

Pruritus is sometimes a feature of human dermatomyositis (Weber and Gray 1924, Kinney and Maher 1940), and the rubbing of the sheep might possibly be due to a pruritus or possibly to pains or cramps in the muscles. The apparently invariably fatal outcome of the disease in sheep, which is more in keeping with

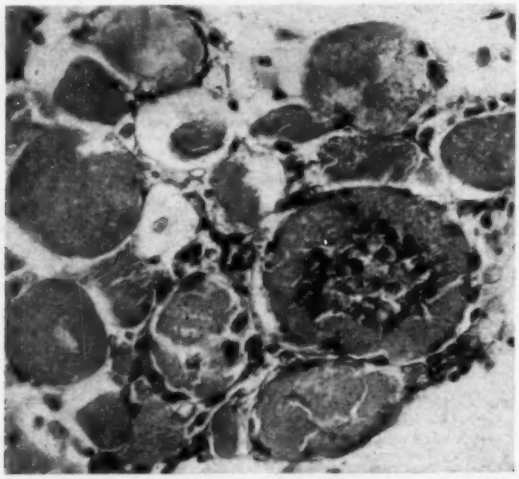


Fig. 13—Transverse section through affected skeletal muscle. Note great variation in size of muscle-fibres, which are all rounded, and increase in nuclei. One fibre contains a mass of nuclei in its centre. (Hæmatoxylin and eosin. × 370.)

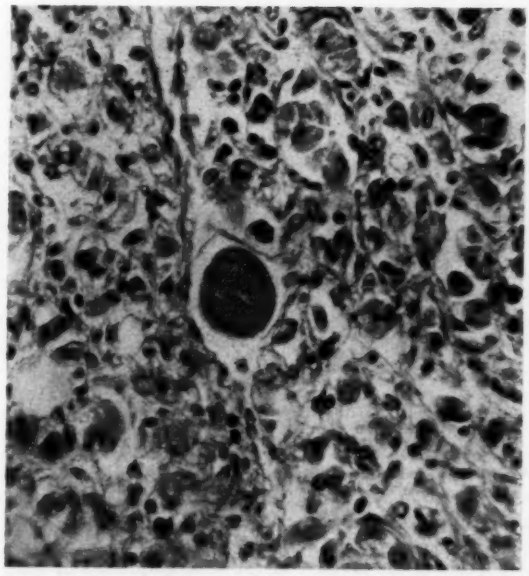


Fig. 14—Transverse section of affected skeletal muscle in which only one recognisable muscle-fibre remains. This is typically rounded. Note remarkable cellularity. (Iron hæmatoxylin and van Gieson. × 370.)

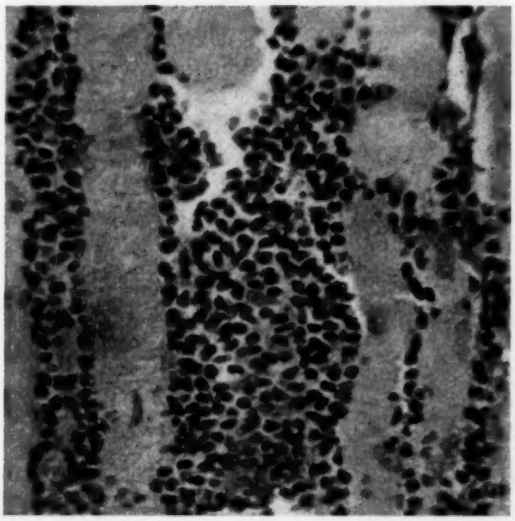


Fig. 15—Densely staining nuclei of various types taking place of degenerated muscle-fibres in affected skeletal muscle. (Iron hæmatoxylin and van Gieson. × 460.)

muscular dystrophy than with dermatomyositis, may be due to the fact that only the more severe cases are recognised; indeed we have reason to believe that this is so.

In man muscular dystrophy differs from polymyositis (dermatomyositis) in often being inherited, in having several distinctive distributions of the muscles affected, and in its extremely chronic course over many years, although the more chronic forms of dermatomyositis (O'Leary and Waisman 1940, O'Leary 1949) without initial constitutional signs may be not unlike muscular dystrophy. Indeed close scrutiny of the literature on muscular dystrophy suggests that the distinctive distribution of affected muscles is not nearly so clear-cut as might be inferred from the various named types of the disease (Adams et al. 1953, Walton and Nattrass 1954).

The clinical features of the syndromes of myopathy in sheep show general similarities to the principal human types of muscular dystrophy, although we have not yet found a juvenile type.* Whilst involvement of the pectoral and pelvic-girdle muscles does occur preferentially in many cases in the sheep, their involvement is not so spectacular as in man; but in ovine hind-limb palsy the anterior tibial muscles are strikingly affected. The involvement of the extrinsic eye-muscles of some sheep resembles the ophthalmoplegic type of muscular dystrophy described by Kiloh and Nevin (1951), and the onset, age-incidence, and histological picture seen in two unusual cases of human muscular dystrophy (Nevin 1936) were very similar to the sheep disease. The duration of the disease is difficult to assess, because (as a proportion of the life-span) 4–6 months in a sheep is equivalent to 40–60 months in a man; but there is no doubt that the muscle lesion is mainly an acute degeneration such as is seen in fatal polymyositis.

*Since this paper was written we have seen several cases of myopathy in young animals, 4–8 months old, which showed general unthriftiness and great weakness on exertion. One case only has had a necropsy when the typical macroscopic and microscopic lesions of myopathy were found.

Thus it appears to us that ovine myopathy has similarities to both dermatomyositis (polymyositis) and muscular dystrophy, and even to the myotonic dystrophies. On the one hand, the involvement of the skin and the histology of the muscle lesions suggest dermatomyositis, whereas on the other hand the variable patterns of muscle involvement, the apparent absence of constitutional signs, and the familial incidence are more akin to muscular dystrophy. The hypertonia, the stiff gait, and the central arrangement of rows of nuclei in many muscle-fibres are reminiscent of myotonic dystrophy, but we have not observed any cataract in our sheep.

Primary degeneration of muscle may also occur in certain virus infections and nutritional disorders. Thus viruses of the Coxsackie group (Dalldorf et al. 1949) cause, in sucking mice, a very acute muscular degeneration which is histologically much more intense than that seen in the myopathic diseases. Human polymyositis has been attributed to infection with a hypothetical

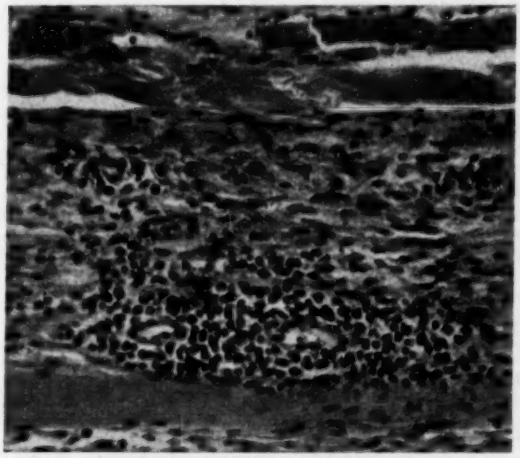


Fig. 16—Focus of small round cells in a degenerate area of affected skeletal muscle. (Iron hæmatoxylin and van Gieson. × 216.)

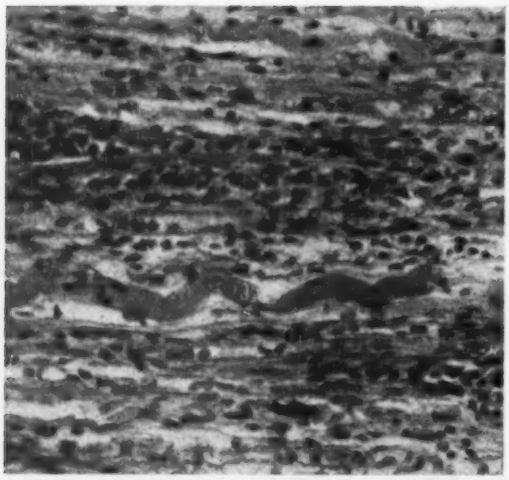


Fig. 17—One rather shrunken but recognisable muscle-fibre among rows of swollen sarcolemmal nuclei lying within sarcolemma, with virtually no recognisable sarcoplasm. Nuclei of other types are also seen. (Iron hæmatoxylin and van Gieson. × 216.)

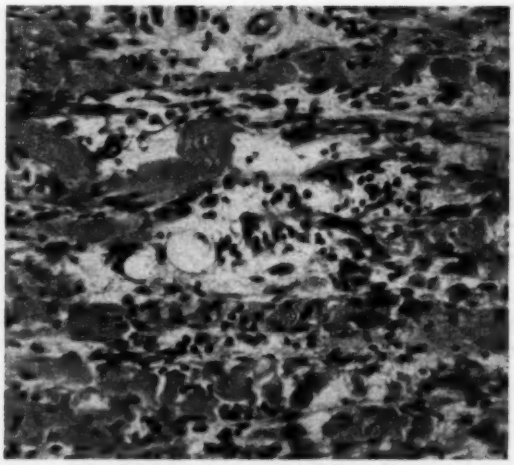


Fig. 18—Extremely degenerate and disorganised skeletal muscle. (Iron hæmatoxylin and van Gieson. × 216.)

virus, but no good evidence for this view has been brought forward. The so-called nutritional muscular dystrophies are intimately related to vitamin-E metabolism (see Blaxter et al. 1952, Mackenzie 1953), but other factors, such as the unsaturated fatty acids of the diet, are probably concerned (Blaxter et al. 1953). The histological findings in these nutritional dystrophies are those of a severe primary muscle degeneration in some ways not unlike those reported here.

Again, degeneration of muscle in man may be found associated with carcinoma (Denny-Brown 1948, Henson et al. 1954), but we have not found any carcinomata in these sheep.

The essential similarity between the histological picture in this wide range of primary muscle degenerations, and those we have described in the sheep suggests that patterns of muscle degeneration are limited (just as the patterns of retinal degeneration are limited [Parry 1955]). Apparent differences may be largely due to differences in the rate of progression and in the period of survival.

Though it is always dangerous to try to draw too close an analogy between animal and human diseases, there is no doubt that the study of the pathological changes in animal diseases often throws light on somewhat similar human conditions. The muscular dystrophies and polymyositis are some of the most obscure conditions in human pathology, and a study of the literature reveals a chaotic lack of knowledge.

The discovery that the sheep has myopathy provides opportunities for developing experimental studies which will, we hope, provide a stimulus to the renewed investigation of the myopathic disorders of man as well as promote a new approach to the problems of the sheep disease.

The degenerative changes in the intrafusal muscle-fibres of the muscle spindles in both the severely affected limb-muscles and the extrinsic eye-muscles are of considerable importance. Such changes in muscle spindles have not been reported hitherto, and their presence goes far to explain the severe ataxia seen in many sheep without extreme muscle wasting. It has been said that muscle spindles are unaffected in human muscular dystrophy (Batten 1897, 1910, Adams et al. 1953), but our own observations throw doubt on this statement. The intrafusal muscle-fibres of the muscle spindles are supplied by small motor or γ efferent nerve-fibres. Modern views on the important part played by this γ efferent supply in regulating the activity of the muscle spindles in limb muscles will be found in Granit (1955), and a note on the same supply to the spindles of the extrinsic eye-muscles is given by Cooper et al. (1955). Normally the primary or annulospiral sensory nerve-endings of a muscle spindle record changes in the length of the muscle. These sensory endings are, however, closely related to the intrafusal muscle-fibres, and their responses are profoundly modified by the activity of the γ efferent nerves which control the degree of contraction of the intrafusal muscle-fibres. When these little intrafusal muscle-fibres have degenerated, as in severely affected muscles in these sheep, the effectiveness of the γ efferent system must be seriously impaired, and the incomplete impulses sent to the central nervous system could well explain the ataxia found clinically in our myopathic sheep.

Fig. 19—Focus of small round cells and some polymorphs in degenerate muscle. (Hæmatoxylin and eosin. × 216.)

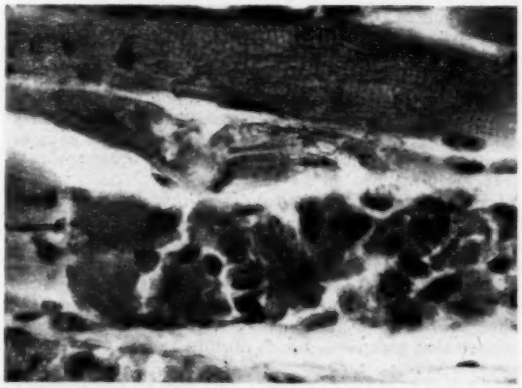


Fig. 20—Longitudinal section showing disintegration of one muscle-fibre with a normal fibre above. From the semimembranosus muscle shown in fig. 1. (Iron hæmatoxylin and van Gieson. × 570.)

RELATION TO OTHER ANIMAL DISEASES

Published reports on muscular dystrophies in animals are extremely scanty (Ziegler 1929, Innes 1951), and we have not been able to find any account of a disease in sheep of the kind we are reporting, although a congenital form of myotonia in the related goat is known, on which a considerable amount of physiological work has been done (Kolb 1938, Brown and Harvey 1939).

Hobmaier (1925) described a degeneration and calcification of skeletal and heart muscles in lambs in Estonia. Recently in North America a similar syndrome, called "stiff lamb" disease or "white muscle" disease, has been reported in which the lambs become very stiff and then weak, and at necropsy white streaks, often hard and calcified, are found in the skeletal and cardiac muscles. This syndrome occurs chiefly in young sucking lambs and may be prevented and cured by giving vitamin E (Sholl 1939, Willman et al. 1946). This disease has been reported in Britain (Cotchin 1948), but the age-incidence, mode of onset, and macroscopic character of the muscle lesions are quite unlike the myopathy described here.

Primary degeneration of muscle may be due to specific infections, nutritional and metabolic disturbances, or hereditary factors. The known infections are all viruses of the Coxsackie and related groups (Rhodes and van Rooyen 1953); but no virus of such a kind affecting sheep has been recognised. Nutritional and toxic agents certainly play a part in "white muscle" disease of sheep, but this disease is different clinically and pathologically from the myopathy which we describe. Our sheep have always been housed out of doors and fed on green foodstuffs; they have not had special oil supplements, such as cod-liver oil, which is known to precipitate the nutritional muscular dystrophy of calves (Blaxter et al. 1953), and the treatment of one case with 50 mg. of α-tocopherol acetate a day parenterally for six weeks had no beneficial effect. We therefore feel that it is unlikely that the myopathy we describe is a muscular dystrophy of the vitamin-E-controlled type.

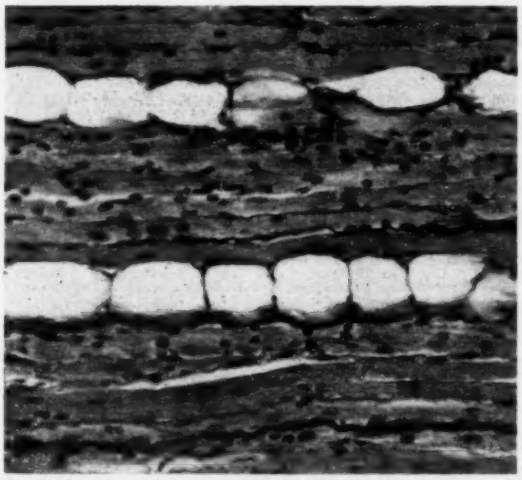


Fig. 21—Longitudinal section of affected muscle. Muscle-fibres are shrunken, and there are many spaces filled with fat between the muscle-fibres. (Iron hæmatoxylin and van Gieson. × 216.)

AN INHERITED DISEASE?

Finally, when we consider the possibility of hereditary factors we find our epidemiological data are not comprehensive enough to establish that these myopathies are genetically determined although many experienced sheepmen hold most strongly that scrapie is inherited. The data establish conclusively the high attack-rate in certain flocks and in certain families within flocks, and this strong familial incidence is more consistent with a genetically determined disease than with an infectious or nutritional disease, although the hereditary trait may be modified by environmental factors. It may well be that the hereditary trait causes some widespread metabolic disturbance, which in its turn is responsible for the muscle degeneration. This hypothetical metabolic defect may perhaps be secondary to an endocrine disturbance, for we are impressed by the preponderance of cases in the second pregnancy and by our failure to find a case in a virgin sheep.

If the myopathies of the sheep are partly due to hereditary factors, as we are inclined to believe, it would strengthen their similarities to the human muscular dystrophies, for the familial incidence and probable hereditary basis of many of these syndromes have been emphasised by many observers (Bell 1943, Tyler and Wintrobe 1950, Stevenson 1953, 1955, Stevenson, Cheeseman, and Huth 1955, Walton et al. 1955). Although various modes of inheritance—e.g., male sex-linked recessive, autosomal dominant, and intermediate types—have been suggested, few pedigrees of human cases are sufficiently extensive to allow a satisfactory genetic appraisal. In this connection the extensive kindred studied by Tyler and Stephens (1950) is of particular interest.

They traced 159 people with the facio-scapulo-humeral type of the disorder among the 1249 descendants of one dystrophic progenitor. Although Tyler and Stephens have called the dystrophy in this family a facio-scapulo-humeral type, their illustrations of the cases suggest that the disease was far more widespread throughout the musculature and hence not unlike the disease found in many of our sheep. Where one parent, either father or mother, was dystrophic, about half the children were affected, but the age of onset and the severity of the disease showed very great variation, and these workers suggested that an occasional case of the disease might easily be missed on physical examination, but that such a patient could transmit the disease.

Such a natural history is very similar to what we see in the sheep.

THE PROBLEM OF SCRAPIE

Though the discovery of a myopathy in sheep is new, some of the clinical syndromes in which it occurs in association with rubbing have been recognised for many years under the title of scrapie, although the non-rubbing and non-wasting syndromes have not been recognised previously. That our observations are strictly pertinent to scrapie is shown by the fact that complete necropsies of 34 consecutive cases of undoubted scrapie have all shown the myopathic lesions.

Various theories of the ætiology of scrapie have been propounded (see Greig 1940), but one widely accepted at present is that it is due to a virus infection of the central nervous system (Cuillé and Chelle 1936, 1938) with an incubation period of up to five years (Gordon 1946, Wilson 1952). The principal lesion reported is the intracytoplasmic vacuoles in the large neurones of the brain stem and spinal cord (Besnoit and Morel 1898). Some workers (Brownlee 1940, Holman and Pattison 1943) have suggested that these vacuoles are pathognomonic of scrapie, but in our experience they are inconstant in affected animals, they may be found in clinically normal animals, and their location does not explain the clinical signs, which are explained only by the myopathic lesions. Indeed no acceptable pathological basis of the clinical signs of scrapie has been reported hitherto. In those cases in which we have examined the nervous system we have not found any of the classical histological features usually associated with fatal virus infections of the central nervous system.

The recognition that many cases of scrapie are but part of a more widely occurring myopathy, possibly hereditary, suggests that the interpretation of the results of inoculation experiments purporting to establish scrapie as an infection of the central nervous system (Wilson et al. 1950, Wilson 1952) is open to question. There are good grounds for suspecting that the so-called "normal" sheep used for these experiments were not free from the myopathic trait, for they were mainly of a breed well known to suffer from scrapie, and in our view the precautions taken did not make it certain that the sheep used in these experiments were completely free from all forms of scrapie.

It is possible, of course, that experimental scrapie is not identical with the naturally occurring disease which we have described. It would be of interest to know whether the experimental disease does in fact exhibit the muscle lesions and other criteria we have reported, and whether the various clinical manifestations of scrapie have been reproduced.

The view that any breed of sheep or any country is entirely free from scrapie is difficult to sustain in the light of this new knowledge of the various types of the disease, particularly the recognition of the intimate relation to scrapie of the new syndromes which have not been described hitherto. Indeed it is highly improbable that any of those countries which have derived their sheep stocks from those of Western Europe over the past two centuries are completely free from all types of myopathy.

Summary

The positive findings in a hitherto unrecorded myopathy in sheep, based on a study of 439 cases, are described. In 45 cases a full clinical examination was followed by a detailed necropsy at which all the skeletal muscles were dissected out and examined. 15 unaffected sheep were examined in the same way, both clinically and pathologically, as controls.

The principal pathological lesions are degeneration of the skeletal muscles and sometimes of the myocardium. The adrenal glands are constantly enlarged, and the lymph-nodes occasionally. The skin commonly shows a rash with papular eruptions and subsequent alopecia, and there are usually signs of rubbing, without any evidence of external causes of irritation.

The histological lesion is that of a primary muscle degeneration, similar to a polymyositis (dermatomyositis) or to the more acute lesions of a muscular dystrophy. The brain, spinal cord, and peripheral nerves show no evidence of any appreciable degeneration.

The intrafusal muscle-fibres of the muscle spindles of both the affected limb muscles and the extrinsic eye muscles show degenerative changes. There is severe ataxia, which may be partly or wholly explained by the degeneration of the muscle spindles.

The myopathy is usually insidious in onset, slowly progressive, and usually fatal. In most cases the skeletal muscles are wasted in the later stages.

The myopathy affects male and female sheep, usually in middle age ($2^1/_2$–$3^1/_2$ years old), and particularly females in their second pregnancy. The annual attack-rate may be 10% of the breeding females; in exceptional instances it reaches 25%.

Six principal clinical syndromes of myopathy in sheep are described, two of which, hind-limb palsy and post-partum pining, have not been reported previously. The other syndromes are forms of the disease known as scrapie.

The relation between the myopathy and scrapie is described, and the implications of this to the possible ætiology of scrapie are considered. There is no sound evidence that scrapie is due to an infection of the central nervous system.

The relation of the myopathy in sheep to polymyositis (dermatomyositis) and muscular dystrophy in man is discussed.

We thank the Nuffield Foundation for their generous support, Dr. G. S. Dawes for his interest and encouragement, Mr. R. Beesley for the histological preparations, Mr. H. Elvidge for assisting with the necropsies, and the many flock-masters and shepherds who, by keeping records and by frank discussion, have provided most valuable information.

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EFFECT OF UNABSORBED RADIOGRAPHIC CONTRAST MEDIA ON THE CENTRAL NERVOUS SYSTEM

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With illustrations on plate

MYELOGRAPHY is a valuable and often essential aid in the diagnosis of intraspinal lesions, but the radio-opaque iodised compounds which are widely used for this purpose are not completely harmless as is sometimes believed.

Oldberg (1940) drew attention to the dangers of using such compounds in susceptible patients.

Tarlov (1945) described a case of severe meningitis following the intrathecal injection of 'Pantopaque' (ethyl iodophenyl-undecylate) sixty hours previously.

Erickson and Van Baaren (1953) reported how an exudative and adhesive arachnoiditis led to obstruction of the fourth ventricle and basal cisterns in a patient who died fifteen months after myelography.

Albrecht (1925) and Peiper reported other complications; Wartenberg (1926) mentioned paralysis of cranial nerves, especially those controlling the eye muscles, as a complication of myelography.

Jaeger (1950) showed that the irritating effects of injected compounds were due to the tiny dispersed particles produced when the substance became emulsified. Marcovich et al. (1941) showed that the arachnoid reaction due to pantopaque was less likely if the dura mater was not opened at operation.

Other authors (Bering 1950, Bull 1950) have observed no ill effects from the injection of 'Myodil' (ethyl iodophenyl-undecylate) into the subarachnoid space; while Peacher and Robertson (1945) found adverse reactions extremely rare, the meningeal response being confined to minimal and transient changes in the cerebrospinal fluid.

Most authors agree that the contrast medium is absorbed from the subarachnoid space in time.

Wyatt and Spurling (1944) found that the absorption of pantopaque was most rapid in the first few months after injection, and that the average rate of absorption was 0·5 ml. in eleven months. Peacher and Robertson (1945) found that amounts up to 0·2 ml. were absorbed in from twelve days to five months. Strain et al. (1946) found that in dogs, pantopaque was absorbed at the rate of 0·5–1·0 ml. per year.

Present Study

In this investigation 119 patients who had undergone myelography were studied: as 6 of them had had two such examinations, the total number of myelograms was 125. Myodil was used in 124 cases and 'Lipiodol' (iodised poppy-seed oil) in 1. The length of follow-up was from one to fifteen years (table I). The average

TABLE I—LENGTH OF FOLLOW-UP

Years	1	2	3	4	5	6	15
No. of patients	27	26	17	22	19	7	1

amount of medium injected was 5 ml.: not less than 3 ml. or more than 6 ml. was ever used. An attempt at removal of the medium had been made in only 6 cases, but all the patients showed residual contrast media in the subarachnoid space: in 1 it was present within the cranial cavity only, in 68 in the spinal theca only, and in 50 in both situations. The route of injection was by lumbar puncture in 120 cases, by cisternal puncture in 7, and by both routes in 2. The diseases for which the patients were investigated are shown in table II; 78 of these were treated by operation and 41 conservatively.

Complications Following Injection of Myodil

The difficulty inherent in an investigation of this kind is to prove beyond all reasonable doubt that any particular symptom or sign is due to the effect of the contrast media in the subarachnoid spaces of the central nervous system. It was considered reasonable, however, to assume that any new symptom or sign appearing immediately after, or within a short interval of, the injection

TABLE II—DISEASES FOR WHICH MYELOGRAPHY WAS PERFORMED

Disease	No. of cases	Myelogram	
		Diagnostic	Negative
Prolapsed intervertebral disc, Cervical			
" " " Thoracic	92	77	15
" " " Lumbar			
Arachnoiditis	3	3	0
Spinal-cord tumour	7	7	0
Organic nervous disease	13	7	6
Congenital lesions	2	1	1

of the media was due to that substance, always provided that the technique of injection was correct.

In the present series of 125 myelograms 70 patients showed abnormal reactions to the injection of myodil. In 56 patients the reactions were noted immediately after the injection or within a few hours, and in 14 the symptoms had persisted or had developed later and were found when the patients were examined a year or more after the myelography. In 22 cases (18%) the symptoms and signs were considered doubtful because they could not be differentiated from those due to the original disease

TABLE III—ACUTE SYMPTOMS FOLLOWING INJECTION OF MYODIL

Symptoms	No. of cases
Headache only	11
Headache and stiff neck	12
Headache, stiff neck, giddiness, and vomiting	14
"Meningism"	2
Cranial-nerve palsy (diplopia) (3rd and 6th nerves)	1
Nystagmus	3
Retention of urine	3
Pyrexia	10
Diarrhœa	1
"Shock"	1
Severe pain in spine	16
Severe muscular cramps	4
Original symptoms made worse	10
Increase in sensory symptoms only	3

or to the operation. In 33 cases (26%) no ill effects were noted after the injection of myodil.

Immediate Reactions Following Injection of Myodil

Of the 56 cases in this group the symptoms were considered severe in 47 and mild in 9 (table III).

Headache, alone or with neck stiffness, nausea, vomiting, and giddiness, was common. Severe pain in the spine, usually lumbar but occasionally cervical, was also common. An increase in the severity of the original symptoms was especially common in the cases of spinal tumour, arachnoiditis, and prolapsed intervertebral disc. The symptoms lasted from a few hours to fourteen days.

The cases of meningism, cranial-nerve palsy, and nystagmus followed cisternal myelography. The symptoms of meningism lasted three days, the cranial nerve palsy three weeks, and the nystagmus two weeks. The patient who became "shocked" after lumbar injection had a pale cold skin, tachycardia (130 per minute), and pyrexia (102°F), and all his limbs became "stiff." The condition improved in two hours but gave rise to some anxiety.

A raised temperature, ranging from 99°F to 102°F and persisting on an average for three days, was found in 10 patients. Retention of urine was present in 3

patients and lasted two, four, and seven days, but recovery was complete. In 4 other patients disturbances of micturition developed later and persisted.

Chronic Symptoms Attributed to Myodil

For this investigation the patients were examined and their skull and spinal column radiographed. An attempt was made to correlate the symptoms with the position and distribution of the myodil remaining in the subarachnoid space. The limitation of this method is obvious; for, except where operative and post-mortem evidence was available, it was impossible to incriminate the contrast media with certainty.

As has been previously mentioned, myodil was present in the cranial cavity in various amounts in 51 patients, of whom 7 had no apparent ill effects. All the 119 patients had residual myodil in the spinal subarachnoid spaces, but 33 had no abnormal symptoms after the injection. In 22 patients it was impossible to decide whether or not the symptoms present at the time of examination were due to the contrast media, to the natural progression of the disease, or to postoperative complications.

Table IV indicates the various symptoms which were causing disability at the time of the follow-up and had already persisted for a year or more from the time of the injection or had developed shortly thereafter.

TABLE IV—PERSISTENT SYMPTOMS FOLLOWING INJECTION OF MYODIL

Symptoms	No. of cases
Chronic headache	7
Chronic neck pain	5
Chronic neck stiffness	1
Persistent severe backache	6
Incontinence of urine	1
Frequency of micturition	2
Difficulty in starting micturition	1
Continuous pain and cramp in legs	12
Previous symptoms worse	3
Herpes and post-herpetic pain	1
Intercostal neuralgia	2
Paraesthesiæ in legs	1
Paraesthesiæ in fingers	1

Operative Findings

Laminectomy was performed on 5 patients a year or more after myelography. In 4 patients it was the second operation, and in each case the arachnoid was found thickened and lined by a tough sticky white exudate. The nerve-roots were adherent to the exudate, and in 1 case the nerves of the cauda equina were deeply embedded in the thick membrane lining the arachnoid. When the dura was opened, the cauda equina could not at first be seen, and subsequently it was found impossible to free the nerve-roots (fig. 1). These findings resemble those described by Tarlov (1945). In another case the subarachnoid space showed several loculi containing globules of myodil.

Post-mortem Appearances

3 patients who had undergone myelography from one to four years previously died from causes other than their original disease—1 from meningitis, 1 from coronary occlusion, and 1 from massive gastric hæmorrhage. In all 3 the pia-arachnoid showed changes similar to those found in the operation cases already mentioned; in 1 case the basal meninges of the brain were thick and opaque. This patient had had severe headaches after the myelogram, and radiography of the skull before death had revealed myodil globules scattered throughout the basal cisterns. All 3 patients had complained of persistent backache and neck stiffness; 1 patient had severe intercostal neuralgia and a herpetic eruption following the myelogram.

Radiographic Appearances

By screening the patients in this series it has been confirmed that myodil becomes fixed in position in the subarachnoid space from a few months to a year.

Figs. 2 and 3 show residual myodil in the subarachnoid spaces of the brain and spinal cord two years after myelography. These are representative of the cases in this series, because, though the distribution within the cranial cavity varies, globules of myodil have been most commonly seen in the basal cisterns, in the floor of the anterior and middle fossæ, and scattered throughout the posterior fossa.

Discussion

The high incidence of immediate reactions in this series seems to be at variance with previously published reports, but the proportion of severe symptoms could not be ignored and show once more the necessity for restraint in employing this admittedly valuable procedure. There seems to be no reasonable doubt that, in susceptible patients, the injection of ethyl iodophenylundecylate is not without danger, and special care should be taken when the cisternal route of injection is used.

While the true incidence of persistent symptoms due to unabsorbed contrast media is difficult to assess, they were significant in 14 patients in this series. The operative and necropsy findings are unequivocal evidence that the contrast medium has a permanently damaging effect on the pia-arachnoid and can cause obstruction in the subarachnoid space; severe and fatal complications have occurred (Erickson and Van Baaren 1953). No attempt was made in this investigation to estimate the amount of residual contrast medium in the subarachnoid space, but the large amounts present in the cranium and spinal canal many years after injection indicate a slow rate of absorption and emphasise the desirability of removing as much of the contrast medium as possible after myelography or at operation. This should diminish the chances of the substance entering the cranium and producing disabling symptoms.

Summary

The results of a follow-up of 119 patients who had undergone 125 myelograms for various diseases of the spinal cord from one to fifteen years earlier are reported.

In 70 patients abnormal reactions followed the injection of myodil into the cisterna magna and lumbar theca.

56 patients developed immediate symptoms; in 14 patients the symptoms became chronic.

The various symptoms are discussed, and the findings at operation, necropsy, and radiographic examination are described.

The contrast medium should be removed, if possible, after myelography.

I am grateful for a research grant from the funds of the Middlesex Hospital Medical School and for facilities at the Institute of Clinical Research. I am also indebted to the consultant staff of the Middlesex Hospital for permission to examine their patients. To Miss E. Hewland, medical artist, and to Mr. M. Turney, of the photographic department, my thanks are also due for their coöperation.

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THE MORPHOLOGY OF TREPONEMA PALLIDUM

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With illustrations on plate

Treponema pallidum has been described as a spiral organism since its discovery by Shaudinn and Hoffmann in 1905. There is, however, no mention in their description or in that of Nougushi (1928), or in current books of reference—e.g., Breed et al. (1948) and Wilson and Miles (1955)—of the direction of the spiral. By analogy with spiral plants and animals, the direction of the spiral might be expected to be a species characteristic and therefore of value in identification. This report describes an attempt to define the direction of the spiral of *T. pallidum* and the conclusions reached.

Method

The observations were made on suspensions of virulent *T. pallidum* (Nichols strain) prepared for use in the treponemal immobilisation test. The conclusions reached were confirmed by examination of *T. pallidum* from two cases of seropositive primary syphilis. In addition, one strain of *T. pertenue* and one of *Borrelia refringens* were examined for comparison. Observations were made by dark-field microscopy at a magnification of ×1500. The appearances observed were compared with suitable models made of soft wire or pipe-cleaners. The photomicrographs were taken with an 'Exakta' camera with the 750-watt low-voltage lamp described by Kingsbury (1954) as the source of light.

In the description of spirals the terms left-hand, right-hand, and pitch are used in the same sense as applied to screw-threads.

Results

As the direction of the spiral of *T. pallidum* was not obvious, it was decided to examine a series of treponemata and to describe each as left-hand or right-hand spirals. It was expected that a significantly large proportion would be allotted to the correct direction. Of 20 treponemata 6 were described left-hand and 6 right-hand and, in the remaining 8 no evidence of direction of spiral was obtained. The conclusion reached was that either both left-hand and right-hand forms occurred, or that *T. pallidum* was not a spiral.

Characteristics to be expected of a spiral were considered. As a spiral is circular in cross-section, its apparent diameter would be constant irrespective of its position, unless it was distorted by active movement. Therefore:

1. If a non-motile organism was followed when drifting passively across the field, the over-all diameter of any portion would remain constant.

2. If a motile organism were examined, where active movement distorted the spiral, any reduction in over-all diameter would be associated with an increase in pitch (pulling-out of the spiral) or an increase in thickness of the filament.

Neither of these criteria was fulfilled by *T. pallidum*. Non-motile organisms showed changes in apparent diameter associated with movements of the suspending medium, and motile forms showed changes in shape which could only be produced in spiral models by a gross pulling out of the curves that was not observed in the organism.

Further examination suggested that the curves of *T. pallidum* lay in one plane. Models of this flat wave form could simulate all the static appearances seen, with little or no distortion of the models (figs. 1–3).

Only one form of motility appeared inconsistent with the flat form. This was a rapid rotation round the long axis of the organism, associated with an appearance like the thread of a screw passing along its length. This form of motility was therefore studied in detail. Prolonged observation revealed occasions when the movement stopped momentarily while incomplete. It was then seen to consist of a wave of activity passing from one end of the organism to the other, each loop in turn rotating through about 180°. Occasional organisms were found in which the origin of the activity was in the length of the organism, and the contraction diverged to each end. At this stage of the investigation I became able to visualise *T. pallidum* as a flat wave form when viewed at a magnification of ×1500. At a lower magnification it still appeared as a spiral.

T. pallidum from two cases of seropositive primary syphilis were found to be of the flat wave form identical with the Nichols strain. One strain of *B. refringens* was easily identified as a right-hand spiral. It was further noticed that, when *B. refringens* rotated on its long axis, it moved rapidly through the suspending medium, whereas *T. pallidum* showed no such translational movement when rotating on its axis.

Further examination of more than 200 *T. pallidum* in many different suspensions has confirmed that this organism is flat. The plane, however, in which the waves lie is often twisted up to 180° over the length of the organism, producing zones of apparent narrowing which could appear to pass to and fro along a non-motile treponema rocked by minor movements of the suspending medium (fig. 4).

Non-motile organisms that appeared to be spiral were occasionally seen in suspensions stored at room-temperature or in a refrigerator and were not uncommon in heat-treated suspensions. No motile spiral forms were seen.

One strain of *T. pertenue* was found to be of the flat wave form similar to *T. pallidum* though the filament appeared more slender than that of *T. pallidum*.

No examination by electron microscopy was made, because the preparation of the specimen might flatten the organism. Recently published photo-electron-micrographs (Swain 1955, Zaffiro 1955) do not oppose the findings presented.

Comment

The demonstration that *T. pallidum* is not a spiral raises a problem of nomenclature, in that it is the type species of the treponemata and does not conform to the description of the genus. I suggest that this description be varied to the morphology of *T. pallidum*, and that, if necessary, an additional genus be formed to include organisms of spiral form at present included in the genus Treponema.

Summary

The results presented show that living *T. pallidum* in early syphilis is a flat wave form and not a spiral.

A form of motility, not previously described, consists in a series of waves of activity passing along the organism, each loop in turn rotating through about 180°.

T. pertenue is similar in form to *T. pallidum*. *B. refringens* is a right-hand spiral. The description of a spiral organism is incomplete unless the direction of the spiral is defined.

I am most grateful to Prof. K. R. Hill for the strain of *T. pertenue*; to Mr. K. J. Kingsbury, of the surgical unit of St. Mary's Hospital, London, for advice on dark-field photomicrography; and to Mr. J. S. Sheppard, of the photographic department, Royal Free Hospital, for technical assistance with the photomicrographs.

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PNEUMOTHORAX IN TRACHEOTOMY FOR LARYNGO-TRACHEO-BRONCHITIS

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With illustrations on plate

WHEREAS subcutaneous emphysema is not uncommonly found after tracheotomy for acute laryngo-tracheo-bronchitis, mediastinal emphysema with pneumothorax is not so readily detected.

Case-report

A lean and previously healthy boy, aged 5 years, developed an infection of his upper respiratory tract on Oct. 15, 1955. This became worse, and at 5 A.M. on Oct. 17 he complained of sore throat and difficulty in breathing. He was admitted to hospital at 8.20 A.M.

On admission his temperature was 100·4°F, pulse-rate 160, and respiratory rate 46 a minute. He had audible stridor and severe dyspnœa with recession of soft tissues; his alæ nasi were working vigorously; and he was collapsed and cyanosed.

Operation.—An emergency high tracheotomy was effected within 3 minutes. The patient both ceased breathing and became pulseless for 60 seconds before the trachea was opened. A Parker tube was inserted, and artificial respiration was effectively instituted, with return of the pulse and irregular breathing. The foot of the operating-table was raised to prevent aspiration of blood and secretions. Respirations became regular after a further 3 minutes, but the patient remained shocked. He was given oxygen followed by steam and postural drainage with suction to deal with secretions. A rectal drip was administered; also diphtheria antitoxin 40,000 units intramuscularly (he had not been immunised). The wound was not sutured.

Postoperative Treatment.—The patient recovered from the shock and was given aureomycin 250 mg. 4-hourly and mepyramine maleate 50 mg. thrice daily by mouth. He was also given vitamin-B complex ('Becosym' syrup 1 drachm) to correct possible interference by the antibiotic with the synthesis of vitamin B.

Progress.—At 11 A.M. on Oct. 18 his colour was good, but at 3.30 P.M. the tracheotomy tube was coughed out. He became very collapsed and cyanosed, with considerable respiratory obstruction. Some difficulty was experienced in reinserting the tube. Next day he was breathing quietly and thick mucopus was aspirated from the trachea. Abnormal physical signs were not found in the chest. The tube was removed on Oct. 20, and slight subcutaneous emphysema was noted at the root of the neck. The subsequent course was satisfactory until Oct. 21, when the chest became moist. Examination revealed hyperresonance with weak breath sounds over the right upper chest, suggesting a pneumothorax. Radiography showed a pneumothorax with massive collapse of the upper lobe, pneumomediastinum, and surgical emphysema at the root of the neck (fig. 1). The air was reabsorbed, and by Oct. 31 the chest was normal on radiography. No pathogens were cultured from the nose or the throat. The sputum showed a mixed growth of *Neisseria catarrhalis*, micrococci, yeasts, and *Hæmophilus influenzæ* all insensitive to penicillin, chloramphenicol, and streptomycin, but *N. catarrhalis* and *H. influenzæ* were sensitive to aureomycin and sulphonamides. The patient made a complete recovery and was discharged from hospital on Nov. 8. Radiography 5 months later, on March 12, showed that his chest was still normal (fig. 2). A Mantoux test was negative at 1 in 100 dilution. There was no history of tuberculosis or chronic chest trouble in the family.

Discussion

There seem to be only two ways by which mediastinal emphysema can occur: (1) extrinsic, where air is aspirated or forced, during or after tracheotomy, through the cervical fascia layers into the mediastinum; and (2) intrinsic, where extrapleural rupture of alveoli permits air to travel along the sheaths of the pulmonary vessels to the hilum with rupture into the mediastinum.

Goldberg et al. (1942) suggest that the mediastinal pressure required to rupture the mediastinal pleura is above 20 mm. Hg. In the human cadaver they found that a mediastinal pressure of 40 mm. Hg caused a mediastinal tear most often at the left inferolateral, border of the thymus.

Forbes et al. (1947) "have conclusively shown that, in the dog, air can be drawn into the mediastinum from the cervical region, and that pneumothorax can result from rupture of the mediastinal pleura under conditions which prevail both during and after human tracheotomy; that is, upper respiratory tract obstruction." The pathway was traced by using trypan-blue and lipiodol. Laboratory animals behaved much the same as do tracheotomised patients—i.e., mediastinal emphysema and pneumothorax do not occur in every patient having a tracheotomy.

In the case reported here the operation was conducted without apparent injury and well away from the cupola of the pleura. When the trachea was opened, breathing had ceased for about 60 seconds. Therefore it is unlikely that the condition occurred at the time of operation.

It is possible that extreme efforts at respiration caused rupture of the alveoli by the intrinsic route either before or after tracheotomy. It is more probable, however, that air travelled by the extrinsic route via the cervical fascia, causing the mediastinal emphysema and pneumothorax, beginning when the tube was coughed out, causing very great respiratory obstruction and correspondingly great efforts at respiration.

Only the upper lobe was collapsed. Possibly adhesions prevented the middle and lower lobes from doing so, although the patient had not had any previous illness.

Summary

A case of mediastinal emphysema and pneumothorax in tracheotomy for acute laryngo-tracheo-bronchitis, with complete recovery, is described.

In view of the tendency to spontaneous recovery, this complication is probably more common than is generally recognised.

My thanks are due to Dr. J. P. Walsh, registrar to the hospital, for the clinical notes, and Dr. Frank Pygott, of the Central Middlesex Hospital, for reporting on the radiographs.

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ADVERSE CEREBRAL EFFECTS FOLLOWING ACUTE HÆMORRHAGE IN ELDERLY PEOPLE *

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THE clinical picture of oligæmic shock following acute severe hæmorrhage is universally familiar. The rapid diminution in blood volume causes an abrupt fall in blood-pressure which reflexly evokes homœostatic mechanisms tending to minimise the disturbance (Heymans 1950, Heymans and Delaunois 1951, Heymans and van den Heuvel-Heymans 1951). The intense peripheral vasoconstriction which serves at first to maintain the blood-pressure gives the syndrome some of its most characteristic features. The patient is pale, cold and sweating, over-alert and apprehensive and has a rapid feeble pulse. If the rate and volume of blood-loss are sufficient the reflex mechanisms are overwhelmed, the blood-pressure falls too low to maintain the cerebral circulation, and consciousness is lost.

* Based on a communication to the third International Congress of Gerontology, London, 1954.

It is well established that the human brain is extremely vulnerable even to short periods of vascular insufficiency, although whether the immediate cause of damage is cerebral anoxia or ischæmia has not yet been clearly elucidated (Courville 1939, Hoff et al. 1945, Corday et al. 1953). There is therefore a strong theoretical possibility of permanent damage to the brain due to "cerebral circulatory failure" (Corday et al. 1953) in those who survive an acute severe hæmorrhage. As the cerebral circulation of many elderly people is already becoming defective (Himwich 1951), it is perhaps surprising that so little has been published on the adverse cerebral effects following acute hæmorrhage in elderly people. Physicians have, of course, long been aware that such a disturbance in the cerebral circulation may be followed by a cerebral thrombosis (Collier 1934) or by transient mental confusion in patients old or young; but it is not so widely appreciated that adverse cerebral effects, quite apart from vascular thrombosis, not rarely follow acute severe hæmorrhage in elderly people and that minor dementias and even permanent catastrophic mental impairment may occasionally do so.

I describe here more fully the five cases reported briefly elsewhere of extreme dementia which developed in this way (Bedford 1955, 1956).

Method

This investigation is based on a study of nearly 5000 patients aged 65 years and over seen in the Oxford geriatric unit at Cowley Road Hospital in the six and a half years ending Dec. 31, 1955. Of these, 3782 were inpatients and the remainder outpatients.

The obstacles to an accurate assessment of the part played in the development of dementia in old people by dramatic episodes such as a hæmorrhage, accident, or surgical operation, and the methods whereby these difficulties may be allowed for, have been indicated previously (Bedford 1955).

In selecting the present cases the following criteria were fulfilled:

(1) All the patients selected had an acute severe hæmorrhage necessitating immediate transfusion of not less than 3 pints (1·7 litres) of blood.

(2) They had their hæmorrhage while in hospital under my supervision and they were seen by me before as well as after the hæmorrhage, note being taken of their intellect, memory, and habits, and their ability to fit into their environment. (Further information was obtained from people with intimate knowledge of them—relations, friends, neighbours, almoners, doctors, and nurses.) They were fully investigated clinically, and post-mortem examination was performed.

(3) They were regarded as mentally entirely normal before their hæmorrhage.

(4) Their deterioration of intellect, personality, and performance amounted to gross dementia.

(5) They remained alive for at least four weeks after their hæmorrhage.

(6) Excluded were cases shown post mortem to have had macroscopic cerebral or cardiac infarction, however long ago.

In the period of study 28 of 76 patients who had a massive hæmorrhage survived for four weeks or more; and of these, 5 satisfied the above criteria. These 5 comprise 3 men and 2 women, aged 65–83 (average 74), and all were followed up until they died.

Case-reports

THE FIRST CASE

A man, aged 83, was admitted to hospital with bronchopneumonia. He was a retired hairdresser who for over thirty-four years had had infrequent bouts of dyspepsia due to a radiologically proved chronic duodenal ulcer. This had interfered with his activities on only one occasion twelve years previously, when he had been admitted to hospital after melæna. He had been transfused with 2 pints of blood but had refused operation then and subsequently on the grounds that "I always get better when I eat properly; and anyway I'm too old." He led a full active independent life, and since his wife's death seven months previously had lived alone rather than "be a burden on my children." He was very fond of his 3 children and 12 grandchildren and was deeply respected by his family.

He was a cheerful and intelligent man who would sustain a reasoned discussion on a wide variety of topics and did excellent work under the supervision of the occupational therapist. He made a rapid and complete recovery from his pneumonia. The only abnormalities then revealed on detailed examination were "a deformity of the duodenal cap with no radiological evidence of active ulceration," but his fæces contained occult blood and his hæmoglobin level was 72% (Haldane). In every other respect he was physically and mentally a healthy old man. Special investigations included electrocardiography and estimation of the blood-urea level, and all were normal. At his family's request he was given permission to stay in hospital until his house was redecorated. On the day before his intended discharge he complained of faintness, collapsed, and lost consciousness, with a copious hæmatemesis and the passage of blood per rectum. His blood-pressure was unrecordable and he appeared moribund. Rapid transfusion was begun within ten minutes, first with plasma and then with whole blood, but his blood-pressure was not restored to its normal 140/80 mm. Hg until two and a half hours afterwards, when 5 pints of blood had been given. By that time his pulse-rate, hæmoglobin, and hæmatocrit had returned to normal levels and bleeding had ceased. He was still unconscious, however, with all his muscles flaccid and both plantar reflexes extensor.

About eight hours after his massive hæmorrhage, consciousness gradually returned and the plantar reflexes became normal. His mental condition, however, was one of profound dementia, in that he was doubly incontinent, mentally inaccessible, made only unintelligible noises, and could not feed himself. He could swallow, and he ate mechanically and slowly when fed. He appeared to hear and to see, in that he followed a moving light with his eyes and blinked in response to menace. No other abnormal neurological signs were demonstrable then or subsequently.

Over the next month he made a gradual but limited improvement, in that he could sit out of bed and walked with assistance, would obey simple commands, and could feed himself with a little help. But he remained mentally inaccessible, dull, apathetic, and doubly incontinent. He would sit for hours without movement. His speech was monosyllabic, and his infrequent replies were irrelevant. He did not recognise his relatives and his attendants and did not even know his own name.

He remained in the same deplorable state until his death thirteen months later from bronchopneumonia.

THE SECOND CASE

A man, aged 76, a dealer in antiques, took an active interest in everyday affairs, was good-humoured, alert, and able in debate, had a remarkably retentive memory, was well-informed and widely read, and had a fund of interesting and amusing stories.

He was admitted to hospital for medical treatment of a radiologically proved chronic gastric ulcer which had troubled him intermittently for three years. He had been advised against operation elsewhere "in view of his age, his relatively mild symptoms, and the good response to dietary treatment on each of three occasions." He had an iron-deficiency anæmia—hæmoglobin 68% (Haldane)—and his stools contained occult blood. Physical examination and special investigations (including electrocardiography and blood-urea estimation) showed no other abnormality. He was in all other respects a remarkably well-preserved old man of well above average intelligence.

He was treated on orthodox lines, and unhurried preparations were made to transfuse him with packed cells in view of the evidence of continued occult blood-loss. The day before his transfusion was to be given he had a massive hæmatemesis, during which he lost consciousness and his blood-pressure fell to an unrecordable level. He was given first plasma and then 6 pints of blood during the next twelve hours, by which time bleeding had ceased. Despite a rapid transfusion-rate his systolic blood-pressure had not risen above 60 mm. Hg in the first two hours, but had then been restored to his normal 150/90 mm. Hg. He remained unconscious for ten

hours, during which time the right side of his body was more flaccid than the left and his plantar reflexes were bilaterally extensor. These abnormal neurological signs disappeared on recovery of consciousness, but he had suffered disastrous mental deterioration. He was virtually "decorticate"—doubly incontinent, mentally quite inaccessible, and required to be tube-fed. His blood-urea was 90 mg. per 100 ml. next day but fell to normal within three days; there was no evidence of cardiac infarction.

Some improvement gradually occurred over the next four weeks, but he remained grossly demented, doubly incontinent, occasionally muttering to himself and mentally quite inaccessible, until his death four months later from bronchopneumonia.

THE THIRD CASE

A woman, aged 65, was a rather shy, retiring spinster, well-educated, pleasant, and competent. Since her mother's death forty years ago she had been a nurse-governess and had been with her present employers for eighteen years. She lived as one of the family and regarded them—and was regarded by them—with respect and affection. She read widely, painted in oils, and did excellent crochet.

She was admitted to hospital with bronchopneumonia, which responded rapidly to treatment. Routine examination also revealed an epitheliomatous ulcer of the right labium majus with early involvement of the inguinal lymph-nodes. She had first noticed it two months previously but had not sought medical advice as "I hoped it would heal itself." It had caused her no trouble other than occasionally blood-staining her underclothes.

Examination showed that, except for the epithelioma vulvæ, she was physically and mentally normal. There was no evidence of spread of the growth beyond the right inguinal lymph-nodes; her hæmoglobin was 93% (Haldane). She was kept in hospital pending her transfer to a gynæcological ward, and during her stay her assistance with the other patients was greatly appreciated by the nurses.

Two days before her transfer was due she had a torrential hæmorrhage from the labial ulcer, collapsed, and rapidly became unconscious. When seen three minutes later she was exsanguinated and appeared moribund; her blood-pressure was unrecordable and her radial pulse imperceptible. Transfusion with plasma was begun without delay and within forty-five minutes was continued with whole blood. 4 pints of blood was given in the next twenty minutes, by which time bleeding had ceased and her blood-pressure had returned to its normal 130/80 mm. Hg. She remained in coma with flaccid limbs, dilated pupils, and extensor plantar responses for five hours. With the return of consciousness her plantar reflexes became normal, but her mental state was that of extreme dementia. She was doubly incontinent and mentally inaccessible; she blinked in response to menace and moved her limbs spontaneously but could not feed herself and did not respond to simple commands.

Over the next month gradual but limited improvement took place, in that she became able to feed herself and could walk a little with assistance. She remained torpid, dull, mentally inaccessible, and doubly incontinent. Speech was limited to monosyllables—often incongruous—but she would obey simple commands. She took no interest in her surroundings and could not recognise the members of the family with whom she had lived for eighteen years. She did not even know her own name. She remained a human vegetable, without further improvement, until her death from a further torrential hæmorrhage five months later. Necropsy showed that the cancer had not spread beyond the regional lymph-nodes.

THE FOURTH CASE

A woman, aged 78, was admitted to hospital with a pelvic abscess due to diverticulitis of the sigmoid colon. She was treated conservatively with antibiotics and blood-transfusion and made a good recovery, her hæmoglobin at the end of treatment being 88% (Haldane). In spite of her years she had been an active housewife living with and looking after her daughter and son-in-law. She had helped in the house, done the shopping, and cooked meals for her children, both of whom went out to work. She was a keen knitter, and took an active interest in everyday affairs. Physical examination and special investigations showed no abnormality, and apart from the diverticulitis coli she was a normal woman both mentally and physically.

While convalescing before discharge she had a severe intestinal hæmorrhage, during which she collapsed and lost consciousness. Her blood-pressure was unrecordable for fifty minutes but returned to normal (150/80 mm. Hg) during rapid blood-transfusion. She received 4 pints of blood before the hæmorrhage was brought under control but did not recover consciousness for twelve hours. During her coma her right limbs were more flaccid than the left and both her plantar reflexes were extensor. These abnormal neurological signs disappeared with recovery of consciousness.

After her hæmorrhage she was abjectly demented. Although some limited improvement took place over the next month, her final state was one of gross dementia. She could walk with assistance and fed herself with help, but she remained mentally quite inaccessible, incontinent of urine and fæces, and could not recognise her children or conduct any kind of conversation. Her attention was difficult to gain and impossible to hold. She sat all day in a chair, dull, torpid, and unmoving, and remained in this condition until her death twelve months later from bronchopneumonia.

THE FIFTH CASE

A man, aged 70, was admitted to hospital with bronchopneumonia. He was a retired carpenter who gave an excellent account of himself. He had suffered intermittently from symptoms of chronic duodenal ulceration for twenty-two years but had "never allowed it to interfere" with his work. His ulcer had been demonstrated radiologically fifteen years ago, but surgical treatment had never been advised. He was a careful, painstaking man, and after his retirement he had continued his hobby of model engineering, at which he was an able craftsman. He was knowledgeable, cheerful, and alert and took a keen interest in politics and general affairs. His hæmoglobin was 80% (Haldane), and tests for occult blood in his stools were negative.

While convalescent from the pneumonia, which had responded rapidly to treatment, he suddenly collapsed and lost consciousness with severe gastro-intestinal bleeding. His blood-pressure was unrecordable for forty minutes but was restored to normal (140/80) by giving first dextran and then a blood-transfusion. 6 pints of blood was given before the bleeding was finally controlled eighteen hours later. He remained in coma for ten hours, during which he showed decerebrate rigidity and both his plantar reflexes were extensor. These abnormal neurological signs subsided within four hours of recovery of consciousness, but he showed no attributes of human mentality.

There was a very slight but limited improvement over the next four to six weeks, but his final state was one of gross torpid and inaccessible dementia. He was incontinent of urine and fæces, monosyllabic, and incongruous in reply; he could not recognise his wife and children and did not know even his own name. He never learned to walk again and remained unable to feed himself. His condition remained substantially unchanged until he died of a massive pulmonary embolism seven months later.

Discussion

In these summaries details of physical examination, special investigations, and necropsies have been largely omitted because they do not add to this discussion and because the 5 cases showed no conspicuous differences. Histology of necropsy material (for which I am indebted to Dr. F. D. Bosanquet and Dr. P. M. Daniel) has not proved helpful in these cases, for in old age it is extremely difficult to distinguish with certainty between changes specifically due to anoxic states and those due to diffuse cerebral vascular disease (Bedford 1955).

Incidence

In the six and a half years ending December, 1955, 76 (2%) of the 3782 hospital inpatients aged 65 or more had an acute severe hæmorrhage as defined. Of these 76 patients 28 (37%) lived for four weeks or more and the remaining 48 (63%) died. Of the 28 survivors, 5 suffered extreme mental deterioration and are those whose case-histories have been recounted above. Thus the incidence of dementia was about 1 in 15 of the old people who had a massive hæmorrhage; nearly 1 in 6 of those who survived for four weeks or more; and rather more than 1 per 1000 admissions. The true incidence of this disaster, however, cannot properly be estimated from these data, for the figures are small, the "population at risk"

was not a representative sample of the general population as a whole, and many were by no means "normal old people" before they bled. Moreover the incidence of dementia has been very uneven in distribution, all 5 occurring in the first five years and none at all in the succeeding eighteen months despite a level incidence of cases of hæmorrhage throughout the six and a half years, all treated in the same way and showing a steady annual mortality-rate. It is of interest nevertheless that the incidence of dementia following hæmorrhage shown in the present study is about the same as that following operations under general anæsthesia (Bedford 1955)—6·6% and 7% respectively.

There are no published figures with which to compare those given above. In the Cowley Road Hospital, despite prompt and energetic treatment and an attitude diametrically opposed to the therapeutic nihilism implicit in the adage "the old dog has had his day," the mortality-rate from acute severe hæmorrhage in elderly people remains very high—nearly two-thirds dying within four weeks of the incident. (It is true, too, that some of these patients have coexisting diseases, such as cancer and leukæmia, which are themselves lethal.) There can be little doubt that the mortality-rate of those who bleed severely at home or in many institutions is even greater, and that some have died who need not; but probably 1 in 6 would have been demented had they survived.

As massive acute blood-loss carries so strong a theoretical probability of damage to the brain from cerebral circulatory failure, the incidence emerging from the present study is rather surprisingly low. It must be emphasised, however, that I have been concerned here only with cases of irreversible and unequivocally extreme dementia. I have therefore included no patient who survived for less than four weeks, nor any whose intellectual deterioration was unequivocally less than extreme. Minor degrees of dementia are not rare and though they are difficult to present convincingly, they could be demonstrated by psychometric testing of all patients before and after the event. They have, however, been excluded from the present study because we had no facilities for psychometric testing on a large scale. The patients who are going to bleed cannot be selected beforehand.

Whatever the true incidence may be, the 5 case-histories recounted above clearly establish that an irreversible gross dementia may occasionally be the aftermath of acute severe hæmorrhage in elderly people. And so grave is this catastrophe that it seems reasonable to conclude that hæmorrhage in elderly people carries not only a high mortality but also a serious risk of severe damage to the brain.

Causes of Damage

The delayed pulmonary complications of coma (aspiration-collapse, infarction, pneumonia, &c.), which can themselves lead to brain damage from cerebral anoxia (Bedford 1956), were not a factor in the above histories, for the dementia was apparent as soon as they recovered consciousness (at 8, 10, 5, 12, and 10 hours in cases 1–5 respectively). Nor can respiratory depressant drugs, such as morphine and barbiturates, be incriminated for they were not used in these patients. There can be little doubt that the precipitating factor was the acute hæmorrhagic anæmia and that the immediate cause of the damage to the brain was cerebral anoxia (cerebral ischæmia and anoxia are not yet clinically distinguishable). The sequence of events was: hæmorrhage → diminution in blood volume → fall in blood-pressure → evocation of baroceptor reflexes → restoration of blood-pressure; continuing blood-loss → failure of homœostatic reflex mechanisms → fall in blood-pressure → cerebral circulatory failure. Two other factors contributing to the dementia are the degenerative arterial disease which reduces cerebral blood-flow in many elderly people (Himwich 1951) and the diminished ability in old age to learn new skills (Welford 1950) and so to compensate for any damage done.

Individual Idiosyncrasy

Thus the development of dementia following hæmorrhagic shock in old people is readily understandable; but it is not at all clear why the complication should be uncommon, for it seems to be a logical consequence and should therefore be the rule. This difficulty is not quite analogous to the general problem in medicine of why only some but not the whole of any population "at risk" develops disease, for in the present instance the profound circulatory disturbance of hæmorrhagic shock seems an almost overwhelming challenge to the elderly, who have everything against them. Yet only 5 of the 28 developed extreme dementia despite there being no major differences in age, severity of hæmorrhage, initial hæmoglobin level, and duration and depth of hypotensive state and coma, or in their treatment. It seems necessary to postulate an individual idiosyncrasy—a personal susceptibility or allergy—to anoxia (or ischæmia) in those who suffer brain damage. But whether this idiosyncrasy is a function of the brain itself, or of over-irritability of the baroceptor reflex mechanisms, or of undue cerebral vasoconstriction—a concept in conflict with the views of Pickering (1955) but supported by the work of Byrom (1954)—or of something still not defined, is entirely unknown, and no clue to its satisfactory solution is yet apparent.

Conclusions

Whatever the explanation, however, and although the idiosyncrasy is unpredictable, the complication is such a catastrophe that every possible factor should be considered in taking precautions against it.

Acute blood-loss demands correction even more urgently in the elderly than in the young. Arrest at source is axiomatic if feasible, and the place of surgery, preferably under local anæsthesia, in the prophylaxis and treatment of bleeding peptic ulcer should be given due weight—patients not being rejected on their age alone. The rate and volume of blood transfused should be such as to restore and maintain the blood volume, blood-pressure, and hæmoglobin to optimum levels with the least possible delay. I would also urge the desirability of not temporising with any anæmia in old people, whatever its cause, for hæmorrhage should be better withstood if the initial state of the blood is normal—not to mention the ill effect of anæmia on the aged heart. The routine use of morphine for hæmorrhage is to be deprecated, particularly in shocked elderly patients; for in the phase of extreme vasoconstriction it is ineffective unless given intravenously, large amounts may be rapidly absorbed when the vasoconstriction subsides, and it is in itself toxic to the nervous system. Hot-bottles and heat-cradles have no place in the management of hæmorrhage, for they reduce the vasoconstriction which is itself apparently a compensatory phenomenon, and they may cause burns in the comatose patient. The immediate management of these patients should comprise:

1. Blood—given without delay, in a quantity and at a speed sufficient to compensate for the hæmorrhage and any continuing loss.

(2) If blood cannot be given at once, a "plasma expander" should be infused pending its arrival.

(3) Reinforcement of the postural baroceptor reflexes, and protection of the airway of the unconscious patient against inhalation of vomit, by nursing in the "head-down" or "tonsil" position.

Finally, if the catastrophe occurs, an attempt should be made to minimise the œdema and capillary damage

which takes place in cerebral anoxia and to maintain the nutrition of the brain. In this attempt dehydration therapy, cortisone or corticotrophin, hypothermia, glutamic and succinic acids, and glucose, thiamine, insulin, and oxygen may all have a place, although so far nothing has proved effective.

Summary

Dementia is an uncommon but not rare complication of severe hæmorrhage in old people. 5 cases of extreme dementia are described. Factors contributing to this disaster are discussed and some precautionary and therapeutic measures suggested.

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HYPOTHERMIC MYXŒDEMA COMA WITH MUSCLE DAMAGE AND ACUTE RENAL TUBULAR NECROSIS

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THE occurrence of hypothermia in myxœdema was described by a committee of the Clinical Society of London (1888). Little further attention was paid to this complication until Sheehan and Summers (1952) pointed out that extreme degrees of hypothermia may be unrecognised owing to reliance on the standard clinical thermometer, which does not register temperatures below 95°F (35°C). Since then 12 cases of hypothermic myxœdema coma have been reported, all from the British Isles (Le Marquand et al. 1953, 1955, Summers 1953, Malden 1955). The fact that each of these authors described several patients suggests that the diagnosis must often have been missed by other workers. In none of these cases was any reference made to the condition of skeletal muscle, and no significant renal damage was recorded.

In the case reported here severe and protracted hypothermia was associated with extensive necrosis of skeletal muscle and acute renal tubular necrosis.

Case-report

A woman, aged 70, was admitted to the Royal Victoria Hospital on April 2, 1956. Her health had been good until four years previously. Since then her relatives had noted increasing mental and physical lethargy; she was intolerant of cold weather and spent most of her time in front of a fire. Her voice became hoarse, her hair thin and dry; her face was sallow and swollen with pouches beneath the eyes; and her legs and ankles were often swollen. She was extremely constipated. More recently she had developed extensive bruises with no known relation to trauma. Her husband said that she never felt warm, even in bed. During the few days preceding admission she gradually lapsed into coma.

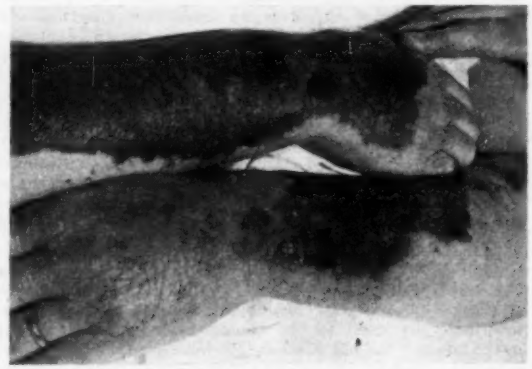

Fig. 1—Skin lesions on forearms.

Condition on Admission

She appeared to be in a state of suspended animation. Her skin was dry and cold like that of a corpse, and there were no spontaneous movements. The facial appearance was that of classical myxœdema: soft, non-pitting pouches of myxœdema tissue were present round the eyes, the eyebrows were sparse, and the scalp hair was thin and dry. Pubic hair was present in the normal distribution, but axillary hair was absent. The pulse was not palpable, and no blood-pressure could be recorded; the heart sounds were faint (rate 45); respirations were slow and shallow. Crepitations were audible at both lung bases. The pupils were contracted and did not react to light; the limbs were flaccid and the deep reflexes absent. Extensive confluent ecchymoses were noted on the dorsal surfaces of both forearms, and in places the overlying skin was necrotic (fig. 1). Besides erythema ab igne, the legs showed less extensive ecchymoses, and several deeper extravasations of blood were noted on the trunk and thighs.

A thermometer reading in the range 0–60°C was used in the mouth, axilla, and rectum to record the body-temperature, the readings being 24°C (75·2°F), 23·5°C (74·3°F), and 23·5°C respectively. The simultaneous ward-temperature was 19°C (66·2°F). Subsequently the thermometer was checked against other instruments in the clinical pathology laboratory and found to read correctly to the nearest 0·5°C (0·9°F).

Treatment and Progress

The patient was immersed up to her shoulders in a bath, the water-temperature being gradually increased from 35°C (95°F) to 40°C (104°F), and the oral temperature was recorded at intervals (fig. 2). After 2 hours' immersion, when the oral temperature was 32°C (89·6°F), the blood-pressure 80/60 mm. Hg, and the pulse-rate 70, she was returned to a warm bed. During the subsequent hours and days her body-temperature continued to rise slowly. Her clinical state improved strikingly, and six hours after admission she uttered several words and recognised her relatives.

Treatment was started with deltacortisone 60 mg. and 15% dextrose solution intravenously. On subsequent days cortisone was given orally in a dosage of 100 mg. a day,

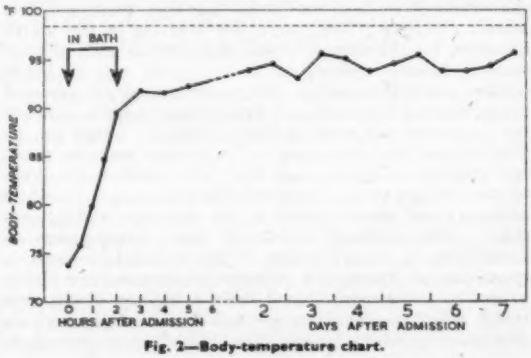

Fig. 2—Body-temperature chart.

reduced three days later to 50 mg. a day. Thyroid hormone was withheld. Penicillin 1,000,000 units and streptomycin 1 g. were given intramuscularly.

Only 60 ml. of urine was obtained by catheter; it was reddish brown, contained much albumin but no erythrocytes, and gave a negative reaction for porphobilinogen. During each of the following days less than 30 ml. of urine was obtained. The fluid intake was restricted to 800 ml. a day by mouth, only glucose drinks being given; the dose of penicillin was reduced, and no further streptomycin was administered.

Special Investigations

Examination of the blood showed hæmoglobin 14·8 g. per 100 ml., leucocytes 11,600 per c.mm. (96% polymorphs), platelets 150,000 per c.mm., Hess test negative, bleeding-time 90 seconds, clotting-time (Lee and White) 7 minutes, prothrombin concentration 100%, and serum prothrombin activity 14%. Serum electrophoresis showed an increase in the β and γ fractions (total 7·3 g. per 100 ml., albumin 3·21 g., α_1-globulin 0·25 g., α_2-globulin 0·5 g., β-globulin 0·9 g., γ-globulin 2·42 g.), and plasma-fibrinogen 0·38 g. per 100 ml. The serum-sodium level was 116 m.eq. per litre, serum-chloride level 86 m.eq. per litre, and serum-potassium level 6·2 m.eq. per litre; carbon-dioxide combining power 18; specific gravity of the plasma 1·029. The fasting blood-glucose was 48 mg. per 100 ml.; blood-urea 128 mg. per 100 ml.; blood-cholesterol 293 mg. per 100 ml. Electrocardiography showed sinus bradycardia with low-voltage complexes and flat T waves in all leads. A chest radiogram revealed left ventricular enlargement, widening and unfolding of the aortic arch, and normal lung fields. The basal metabolic rate, after recovery from hypothermia, was −39%.

The patient died suddenly seven days after admission to hospital.

Necropsy

The external lesions described above were noted. Sectioning of several areas of purplish discoloration on the thighs and trunk revealed recent hæmorrhage into subcutaneous fat. The right pleural cavity was obliterated by firm fibrous adhesions. There were a few millilitres of clear free fluid in the left pleural cavity and pericardial sac. The heart weighed 350 g. and showed only some fat-infiltration of the right ventricle. There was slight to moderate thickening of the wall of the thoracic and abdominal aorta, with moderate atheroma. The coronary and cerebral vessels showed little degenerative change. A moderate amount of pulmonary œdema was noted. Each kidney weighed 250 g. and showed some cortical swelling and pallor. The thyroid was small, hard, white, and slightly nodular. The parathyroids were of normal size. The adrenals appeared normal; after removal of extracapsular fat the right adrenal weighed 7·8 g., the left 5·2 g. The pituitary was of normal size. Examination of the other viscera disclosed only a small fimbrial cyst in relation to the left ovary, several tiny fibroids and a small endometrial polyp in the uterus, and mild diverticulosis of the colon. The liver weighed 1350 g., the spleen 65 g., and the brain 1500 g.

Histology

Voluntary muscle.—Three blocks taken at random from the calf, thigh, and forearm are available. In one of these, numerous muscle-fibres show complete replacement of their cytoplasm by eosinophilic hyaline material which is often fragmented and sometimes forms oval masses (fig. 3). A few fibres are only partially involved, and some less severely affected fibres show prominent myoplasmic vacuolation. Apart from slight proliferation of sarcolemmal nuclei at one or two points there is no cellular reaction. The remaining muscle-fibres show no loss of normal striation, but some are pale. No vascular damage is noted. In sections from the other two blocks of muscle there are similar but less pronounced changes.

Kidneys.—There are a few small areas of old cortical scarring. The glomeruli are slightly swollen and congested. The capsular spaces often contain a moderate amount of pale granular debris. The proximal convoluted tubules are mostly slightly dilated; their lining epithelium shows some flattening and catarrh, and their lumina are filled with debris similar to that in the capsular spaces. In the ascending limbs of Henle, the collecting tubules, and to a lesser extent the second convoluted tubules there are a considerable number of casts, whose appearance in a hæmatoxylin and eosin section varies considerably. Many are deeply eosinophil, amorphous, and

Fig. 3—Voluntary muscle: necrosis and vacuolation of muscle-fibres. (Hæmatoxylin and eosin. × 100.)

hyaline in quality; others brick-red and granular (fig. 4); and a few, especially in the distal convoluted tubules, show varying degrees of basophilia. Some of the affected tubules, especially the collecting tubules, are filled with cast material, and others contain fragments or ribbons. In unstained sections many of the casts appear orange-brown; they do not give Perle's reaction for iron but react positively with Lepehne's benzidine method for hæmoglobin. No red blood-cells are seen in the tubules. In most of the tubules containing hyaline casts and in some cast-free tubules there are large numbers of polymorphonuclear leucocytes with occasional desquamated tubular lining cells. This reaction is greatest in the boundary zone and adjacent medulla. In several places the inflammation has ulcerated the wall of a tubule and extends a short distance into the surrounding tissues (fig. 5). One or two extruded hyaline casts are noted. Apart from these areas, portions of the lining epithelium have also been lost from other inflamed tubules, and the remaining cells are sometimes shrunken. In other places the tubular lining cells are proliferating and occasionally have grown partly or completely over the surface of a cast. In the boundary zone and medulla there is a slight patchy scattering of mononuclear cells in the interstitial tissues; similar cells are often seen in the congested venules in these areas. A frozen section of kidney treated with Scharlach R shows no fat. There is slight arteriosclerosis and arteriolosclerosis. The walls of the renal pelves show slight patchy lymphocytic infiltration and mild congestion.

Skin.—Three sections taken from ecchymotic and ulcerated areas on the limbs show recent hæmorrhage and non-specific superficial ulceration superimposed, in places, on the chronic changes of erythema ab igne. The *subcutaneous fat* shows only recent hæmorrhage.

Heart.—There is slight patchy fibrosis in the left ventricle. The muscle-fibres of the heart appear healthy, and there is no myxœdematous infiltrate. *Aorta:* three sections of thoracic and abdominal aorta are available. Two of them show only atheromatous intimal thickening, with slight fibrosis and patchy areas of fine granular calcification in the underlying media. The third shows considerable adventitial thickening, with some plasma-cell infiltration. In the adjacent media there are several small areas of fibrosis, with destruction of the elastic tissue, new capillary formation, and small plasma-cell aggregates. The vasa vasorum show little change. There is prominent atheroma in the overlying intima.

The *liver* shows only moderate terminal congestion. In the *spleen* there are a few foci of intrasinusoidal hæmopoiesis. *Endocrine glands:* the thyroid is extensively replaced by dense collagen. There are scattered groups of atrophic acini in association with a heavy lymphocytic infiltration. The pituitary shows a considerable decrease of eosinophils. The

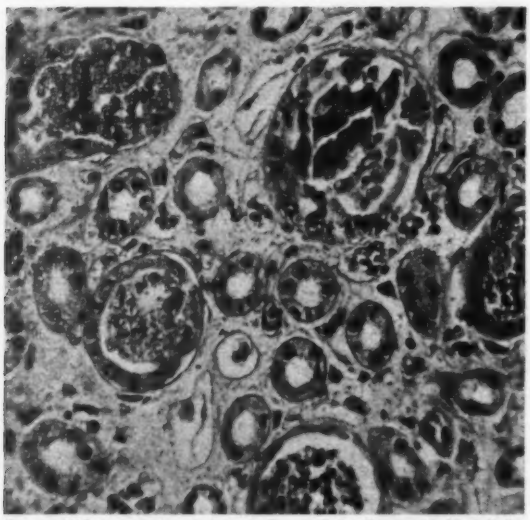

Fig. 4—Kidney: pigmented granular and hyaline casts in tubules. (Hæmatoxylin and eosin. × 330.)

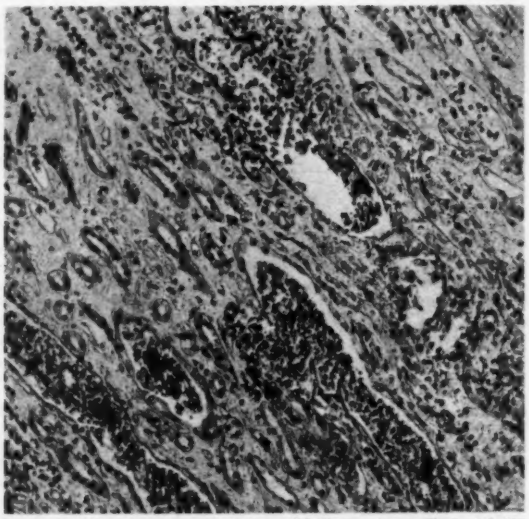

Fig. 5—Kidney: heavy accumulation of inflammatory cells in tubules with ulceration at one point. (Hæmatoxylin and eosin. × 120.)

adrenal cortex is moderately thick and contains little lipoid: there is some nodularity and in places, especially the zona reticularis, considerable lymphocytic infiltration. The medulla is inconspicuous. The pancreas and parathyroids appear normal. *Involuntary muscle:* sections of œsophagus, stomach, small intestine, and urinary bladder show no lesion. *Bone-marrow:* there is moderate hæmopoietic activity in the ribs and vertebræ.

Brain.—Sections of basal ganglia, temporal cortex, and mid-brain show slight thickening of the pia-arachnoid, accompanied by a diffuse light chronic inflammatory-cell infiltration consisting mainly of lymphocytes and histiocytes with a few plasma-cells. The inflammatory changes are greatest around the blood-vessels, and the walls of a considerable number of these show slight to moderate inflammatory-cell infiltration; most are small arteries and arterioles, but several large arteries and some small veins and venules are similarly affected. Apart from adventitial thickening in some of the larger vessels and moderate thickening and hyaline change in the walls of some arterioles the vessels are not otherwise altered. Occasional vessels in the underlying brain show similar changes and slight lymphocytic cuffing. There is slight subpial gliosis, but the architecture of the cortical laminæ is substantially preserved. Elsewhere only slight perivascular œdema is observed. A section of hypothalamus is not available.

Discussion

Coma in severe untreated myxœdema is usually but not always (Levin and Daughaday 1955, Karhausen and Zylberszac 1955) associated with a remarkably low body-temperature. The importance of a cold environment in precipitating coma is clear from the observation that, in all the published cases of hypothermic myxœdema coma, the patients were admitted to hospital during the winter.

Talbott (1948) has stated that the heat-regulating system is presumed to cease functioning below 23·9°C (75°F) and heat-loss subsequently takes place as if from an inanimate object. Recent experience in the use of hypothermia in cardiac surgery has shown that atrial fibrillation commonly develops at temperatures below 30°C (86°F), and around 27°C (80·6°F)–25°C (77°F) ventricular fibrillation and cardiac arrest are likely to

FINDINGS IN HYPOTHERMIC MYXŒDEMA COMA

Reference	Case no.	Age (yr.)	Sex	Initial temperature (°F)	Initial blood-urea level (mg. per 100 ml.)	Necropsy findings		
						Thyroid gland	Other glands	Other organs
Le Marquand et al. (1953)	1	61	F	95·0*	50	Fibrosis	Adrenal hæmorrhages. Reduction of eosinophils in pituitary	Lobar pneumonia
	2	50	F	95·0*	25	Lymphadenoid goitre	Normal	Early glomerulosclerosis
Le Marquand et al. (1955)	3	70	F	74·0	20	Fibrosis	Reduction of eosinophils in pituitary	Coronary atheroma, pulmonary congestion
Summers (1953)	4	59	M	83·0	40	Fibrosis	Normal	
	5	65	F	75·0	31	Gross atrophy and fibrosis	Normal	
	6	63	M	87·5	53	Gross atrophy and fibrosis	Normal	
	7	59	M	83·5	48	Gross atrophy and fibrosis	Excess of basophils in pituitary	
Malden (1955)	8	60	F	95·0*	36	Fibrosis	Normal	Mucinous infiltration of skin and heart
	9	64	F	78·0	14	Lymphadenoid goitre	Normal	
	10	62	F	95·0*	60		(Patient survived)	
	11	67	F	80·0	30	Gross atrophy	Normal	
Present case	12	70	F	74·0	128	Gross atrophy and fibrosis	Reduction of eosinophils in pituitary	Skeletal muscle necrosis, renal-tubule necrosis, meningitis (luetic)

* In these cases an ordinary clinical thermometer was used.

occur. The absence of disturbances of cardiac rhythm in the cases of hypothermic myxœdema coma, in three of which the initial temperature was 24°C (75·2°F) or less (see table), may be due to adaptation to a gradual fall in body-temperature over months or years, as opposed to a sudden drop from the euthermic state during artificially induced hypothermia.

There is little doubt that in these patients hypothermia is the direct cause of coma. Gradual reheating in a warm bath of a patient with hypothermic coma complicating Simmonds's disease was found by Sheehan and Summers (1952) to bring about complete recovery. Similar treatment applied in the present case led to recovery from hypothermic coma, death being due to uræmia. Rapid rewarming should be avoided lest cutaneous vasodilatation further reduce the very low blood-flow to vital organs. Hypoglycæmia is unlikely to have been a significant factor, because consciousness was regained in the bath before any attempt was made to raise the blood-sugar level; further, hypoglycæmia was not found in any other published case.

The electrolyte disturbance and oliguria were initially considered to represent adrenocortical failure, which is known to occur in some cases of myxœdema (Hubble 1955, Curtis 1956) owing either to adrenal hæmorrhage (Le Marquand et al. 1953, case 1) or to secondary involvement of the adrenal glands in the myxœdematous process (Statland and Lerman 1950). However, anuria persisted despite treatment with adrenocortical hormones; it was then thought to be due to renal damage following prolonged hypotension.

That there was widespread damage to voluntary muscle is suggested by the fact that three random samples of muscle all showed recent patchy necrosis similar to Zenker's hyaline necrosis. Several clinical forms of muscular dysfunction, including a diffuse muscular hypertrophy, have been described in association with hypothyroidism. The pathological changes noted have been slight and of doubtful significance (Adams et al. 1953). It seems very likely that the severe muscle damage in the present case was related principally to hypothermia. We have not found any previous reports of muscle necrosis in endogenous hypothermia. However, in the condition of "immersion or trench foot," due to exposure in a cold moist environment, patchy muscle necrosis is one of the most prominent changes noted (Blackwood 1944, Friedman 1945). Blackwood's case 1 represented the early stage of "immersion foot"; the only conspicuous change noted in this foot was patchy Zenker's hyaline necrosis of voluntary muscle. Similar changes have been produced by experimental immersion of the extremities of animals in either water or brine at temperatures about 5°C (41°F) (Blackwood and Russell 1943, Friedman et al. 1950). Blisters, ecchymoses, and superficial ulcers somewhat similar to those noted in the present case are commonly seen in various forms of injury due to cold.

Knocker (1955) reported fatty changes in the liver, adrenal glands, and kidneys of dogs cooled to 77°F. In our patient there was no evidence of direct damage from hypothermia to the viscera.

The renal lesion which was observed is similar to that noted in "crush anuria" (Dunn et al. 1941, Morison 1941, Bywaters and Dible 1942) and also in acute paralytic myohæmoglobinuria (Bywaters and Dible 1943). Though the pigmented casts in the tubules gave the same tinctorial reactions as those attributed to myohæmoglobin, this pigment cannot be positively identified without biochemical investigation. However, in view of the presence of extensive muscle necrosis and the absence of any evidence of intravascular hæmolysis it appears reasonable to regard it as myohæmoglobin.

Ross (1954) found that, in dogs, the secretion of urine, as measured with a catheter in the bladder, diminished with cooling, and at 25°C (77°F) there was usually little or no evidence of secretion. This and other work suggests that oliguria or anuria might develop in severe hypothermia in man merely as a result of depressed renal function.

The microscopic appearances of the aorta and the brain suggest that this woman had a luetic infection. Though little has been published on morphological changes in the brain in either hypothermia or myxœdema, there is no reason to suppose that her chronic meningovascular inflammation had any relation to either of these conditions. Since it could be postulated that inflammatory damage to the thermoregulatory centres contributed to the hypothermia, it is unfortunate that a section of hypothalamus was not available.

Summary

A case of hypothermic myxœdema coma complicated by extensive necrosis of voluntary muscle and acute renal tubular necrosis is described.

It is postulated that the muscle damage was due to the hypothermia.

We express our thanks to Dr. J. F. Pantridge for permission to publish this case, to Prof. J. H. Biggart for his advice, and to Mr. D. Mahaffy, A.B.P.S. for the photomicrographs.

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TRIIODOTHYRONINE IN MYXŒDEMA COMA

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TRIIODOTHYRONINE was discovered and synthesised by Gross and Pitt-Rivers (1951, 1952) and is thought by Asper et al. (1953) to represent the functional constituent of the thyroid hormone. It has since been used successfully in the treatment of myxœdema in man. Therapeutically 3-5-3′-*l*-triiodothyronine differs from *l*-thyroxine in that it is more potent and acts more quickly, and this speed of action has prompted Karhausen and Zylberszac (1955) to suggest its use in myxœdema coma. We report here a case of myxœdema coma treated with triiodothyronine.

Case-report

A woman, aged 70, was admitted to Clatterbridge General Hospital in coma on Feb. 1, 1956. In 1947 she had been treated successfully for severe myxœdema and she was

LABORATORY FINDINGS

—	Feb. 1	Feb. 2	Feb. 3	Feb. 4	Feb. 5
Serum-cholesterol	393	288	..	177	..
Serum-chlorides (as NaCl) (mg. per 100 ml.)	550	532	..	..	..
Serum-sodium	280	270	260·0	260	..
Serum-potassium	..	16	13·5	16	..
Blood-urea	25	..	..	78	..
Blood-sugar	126	..	..	111	..

Red cells 3,890,000 per c.mm.
White cells 8700 per c.mm.
Hb 75%
Urine: protein 0·12 g. per 100 ml., otherwise normal

maintained in good health on thyroideum siccum daily. At some indefinite time before admission she ceased to take her tablets regularly, and in consequence developed the classical symptoms of myxœdema associated with mental and social change. From being an active intelligent woman she became a forgetful antisocial recluse, spending most of her day huddled over the fire. Her condition deteriorated gradually until Jan. 31, 1956, when she had several fits and became unconscious.

On examination she was obese, pale, and comatose, responding only to painful stimuli. She bore the stigmata of myxœdema—coarse scanty scalp hair, loss of the outer third of the eyebrows, and puffiness about the eyes. Her skin was strikingly cold and dry—the touch of a cadaver, as Malden (1955) describes it. Her vaginal temperature, taken as suggested by Sheehan (1955), was 82°F. Her pulse and blood-pressure could not be recorded, and her apex-beat was 34 per minute. Her cardiovascular system was otherwise normal and there were no signs of cardiac failure. Apart from the absence of deep reflexes and bilateral Babinski responses, her central nervous system revealed no abnormality. The lung fields were clear and the respirations shallow and regular at 12 per minute. Nothing abnormal was found in her abdomen.

The laboratory findings are shown in the accompanying table.

Therapy and Results

Detailed information of the dosage, time of administration, and metabolic effects of the drugs used are given in the accompanying figure.

Warmth.—Electric blankets were effective in raising the patient's temperature to normal and maintaining it there. She was nursed between two such blankets, being separated by a rubber sheet from the lower one to avoid possible electrical accidents from incontinence. Artificial warmth was required for 56 hours after admission, 36 hours of which followed triiodothyronine therapy. During this period the body-temperature fell quickly if the blankets were switched off.

Antibiotics.—Crystalline penicillin was given throughout. The chest remained clear until the 3rd day, when bronchopneumonia developed. Streptomycin intramuscularly was then also given.

Fluids and electrolytes.—Oral fluids were given by Ryle's tube initially. When the patient improved she could swallow normally; but, when she deteriorated again, the tube had to be used once more. During the first 24 hours absorption was poor and only 750 ml. of milk and glucose was retained. Thereafter virtually all fluids given were absorbed at a rate of 3–4 oz. hourly, and 'Complan' food concentrate was added to the feed. When the serum-potassium level was found to be low, potassium chloride 1 g. twice daily was given orally. Intravenous saline solution and dextrose were given alternately, 3·5 litres being administered in the first 3 days.

An indwelling catheter was inserted on admission. There was no appreciable urinary output during the first 24 hours. During the 2nd day it was 400 ml. and on the 3rd day 200 ml.

Endocrine substances.—Hydrocortisone was given intravenously for the first 3 days. Its administration preceded that of triiodothyronine by 11 hours, and during this time no clinical improvement was observed. Thyroxine sodium was given intravenously during the 1st day, after which *l*-thyroxine was also given orally.

Triiodothyronine became available 24 hours after the patient's admission. At this time, despite treatment with hydrocortisone, thyroxine, and penicillin, she was unconscious, as on admission, although her temperature had been raised to near normal by the electric blankets. Triiodothyronine 1·2 mg. (the total quantity received) was injected intravenously. During the next 24 hours the following points were noted:

1. The blood-pressure, which could not previously be obtained, became recordable at 80/60 mm. Hg in 8 hours, and in 24 hours had reached 120/80, the previous normal for the patient.

2. The serum-cholesterol level, estimated 9 hours after the administration of triiodothyronine, had fallen to 288 mg. per 100 ml. from the previous day's 393 mg. per 100 ml.

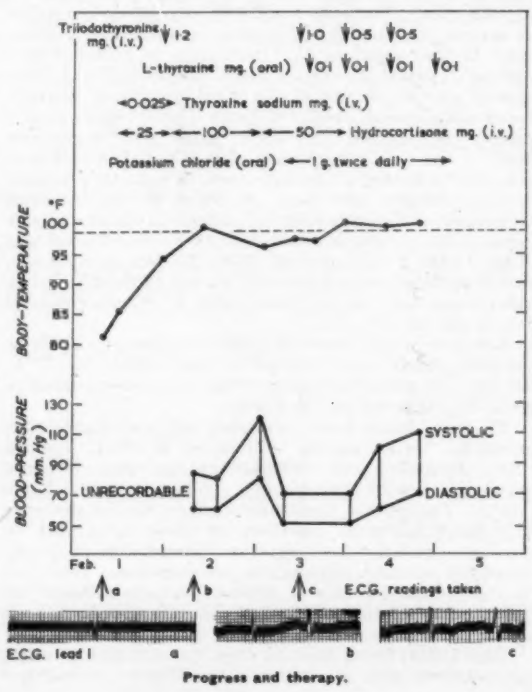
3. The electrocardiograms 10 hours after the drug was given showed a return to normal heart-rate with increase in Q R S complexes and T waves reproduced in the chart.

4. Clinically there was little response for 15 hours, when the patient spoke for the first time since coming into hospital. In a further 9 hours she had improved remarkably. She was fully conscious and answered questions intelligently in a hoarse croaking voice. She knew who she was and where she lived and she showed interest in her condition and surroundings. Her blood-pressure was 120/80, the pulse-rate 74, and axillary temperature 95°F.

At this stage a further delivery of triiodothyronine was expected but unfortunately it did not arrive. Next morning, 34 hours after triiodothyronine had been given, there had been a relapse to the previous condition and the patient was again unconscious. However, her blood-pressure could still be read at 70/50, electrocardiography did not show the former abnormal pattern, and the serum-cholesterol continued to fall. A further supply of triiodothyronine was obtained 36 hours after the first had been given and a further 1 mg. was injected intravenously. There was no clinical response to this, the signs of bronchopneumonia developed, and the patient's condition deteriorated with the development of pyrexia until she died on the morning of the 5th day. No cardiac irregularities were noted at any time.

Necropsy Findings

The *thyroid gland* could not be found, and tissue taken from the usual site of the thyroid gland showed no evidence of thyroid tissue microscopically. The *heart* weighed 20½ oz. There was an excess of epicardial fat. The right ventricle was dilated. The coronary arteries and valves were normal. A small bilateral *hydrothorax* was present. There was acute *bronchitis* with bronchopneumonic consolidation at the lung bases. The *liver* weighed 68 oz. and looked fatty; microscopically there was extensive fatty degeneration. The *gall-bladder* was the seat of chronic cholecystitis and contained calculi. The *spleen* weighed 9 oz. and was congested. The *kidneys* showed arteriosclerosis. The *suprarenal glands*



Progress and therapy.

appeared normal and weighed 1·5 and 1·2 oz. On microscopy there was no significant fatty degeneration of any organ other than the liver.

Discussion

Triiodothyronine.—That 3-5-3′-*l*-triiodothyronine is probably the most potent weapon in the treatment of myxœdema coma is shown by the great clinical improvement in the patient after the failure of previous therapy, which included hydrocortisone and raising the body-temperature. The clinical observations were supported by increased blood-pressure and pulse-rate, a fall in the serum-cholesterol level, and electrocardiographic changes. The advantage of triiodothyronine over *l*-thyroxine lies in its speed of action, for the peak response to it can be expected in 24 hours.

At present triiodothyronine seems to be the drug of choice in myxœdema coma, but the correct dose is uncertain. The dosage given to our patient was based on the work of Asper et al. (1953), Rawson et al. (1953), and Selenkow and Asper (1955), all of whom gave 1 mg. parenterally without serious side-effects. Blackburn et al. (1954) induced some subjective symptoms but noticed no cardiac change or embarrassment following a dose of approximately 0·6 mg. intravenously.

Our dosage of 1·2 mg. was sufficient to restore consciousness and can, therefore, be regarded as the maximum required. That it may be too much is suggested by a so far unpublished case in which 1 mg. intravenously was followed shortly by auricular fibrillation and cardiac failure, so that as small an amount as 0·1 mg. has been recommended. This quantity is also regarded as about the daily normal requirement of the body. However, in coma it may be that initially more will be required than is normal to reverse the deranged metabolic processes, and only further experience will show the dose which will be needed. Perhaps, therefore, until more is known, 0·1 mg. of triiodothyronine should be given intravenously at first. If this dose is adequate, clinical improvement, shown by increase in the blood-pressure, heart-rate, and perhaps temperature, should occur within four to twelve hours. If by then none is noted, probably a further 0·1 mg. should be given and even repeated, after a similar interval, if necessary. Subsequently daily injections will be required until the patient can be maintained by oral triiodothyronine, 50–100 mg. daily—later to be replaced by *l*-thyroxine.

Cortisone and allied substances.—The intravenous hydrocortisone given to our patient had no demonstrable effect on her condition. Although Malden's (1955) successful case was treated with corticotrophin, there is no other definite evidence that myxœdema coma is benefited by the adrenal hormones. Summers (1956) treated cases of myxœdema with cortisone without clinical or biochemical improvement but with some amelioration of lethargy and mental dullness. Cortisone and corticotrophin carry with them certain risks, especially of cardiac failure, and it is perhaps advisable to withhold them in future if triiodothyronine is available and clinically effective.

Warmth.—Raising the patient's temperature to normal has been expected to produce clinical improvement. When this has not happened, it has been suggested that irreversible changes have resulted from the prolonged low temperature. However, the observation that raising the body-temperature to normal had no effect on the condition of our patient is in agreement with the findings in other cases recently described, and that irreversible changes had not taken place is shown by the patient's return almost to normal after the administration of triiodothyronine. On the other hand, experimental hypothermia in animals has been shown by Knocker (1955) to produce pathological changes in vital organs, associated with the widespread deposition of fat; but in this patient only the liver showed fatty changes. The decision, therefore, whether to apply artificial warmth in myxœdema coma is difficult; but perhaps it would be justifiable to try the effect of triiodothyronine alone for 24 hours, and then, if there is no response, to try to bring the body-temperature to normal by physical means. Electric blankets appear to be the most practical way of doing this, because the immersion of a patient, who may well be overweight, in a warm bath may be difficult for the nurses.

Fluid balance.—Patients with myxœdema coma require very little fluid, because loss by skin, respiratory tract, and kidneys is reduced to a minimum. Overloading with intravenous fluids may cause cardiac failure in an already diseased heart. Fluids should therefore be given cautiously, preferably by mouth.

Summary

A case of myxœdema coma treated with 3-5-3′-*l*-triiodothyronine is described.

The various forms of therapy are discussed, and recommendations are given for future cases.

Triiodothyronine appeared to be a most potent therapeutic agent and merits further trial.

Our thanks are due to Dr. H. MacLean for reporting the necropsy findings and to Dr. H. G. T. Bridge for his assistance and advice. Also to Mr. K. Gisborne, chief pharmacist, and Messrs. Glaxo Ltd., who supplied the drug, for their great help in arranging its rapid arrival.

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THE SECRETOR STATUS OF RHEUMATIC-FEVER PATIENTS

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THOUGH a causal connection has been established between group-A streptococcal infections of the upper respiratory tract and rheumatic fever, only a small proportion of such infections actually give rise to rheumatic sequelæ. The possibility that a host factor therefore plays an important part in susceptibility to rheumatic fever has consequently received much attention, but principally in the immunological field. Whether or not rheumatic fever is immunologically determined, a host factor influencing the milieu of the streptococci during the throat infection might well be a contributory factor in the development of the rheumatic process. One such host characteristic which varies considerably between individuals in both kind and degree is the secretion of the known water-soluble blood-group substances, of which none, one, or more may be present in the saliva and, presumably, the mucous secretions of the throat.

In the ABO blood-group system about 80% of people secrete A, B, or H substance (in the water-soluble form) in their saliva. This ability is inherited as a mendelian dominant character (Schiff and Sasaki 1932). In 1946 Mourant discovered the Lewis blood-groups, and he and subsequent workers have shown that the red blood-cells of about 22% of people in England are Lewis-positive (Le(a+)). In 1948 Grubb showed that nearly all persons who do not secrete A, B, or H substance in their saliva have Le(a+) red cells. Brendemoen (1949) and Grubb and Morgan (1949) have shown that the saliva of persons whose red cells are Le(a+) strongly inhibits anti-Le^a agglutinating serum.

We report here a new method of detecting ABH non-secretors, a preliminary survey of their frequency in 450 rheumatic-fever patients, and the findings in a normal population of similar age and sex distribution. A, B, and H non-secretors were detected by testing for secretion of Lewis^a substance in saliva by simple precipitation between patient's saliva and a rabbit anti-Le^a serum.

Methods

Rabbit Anti-Le^a Serum

Rabbits were immunised with group-A type-4 hæmolytic streptococcal vaccines in which the organisms had been coated with Lewis^a substance prepared from human ovarian cysts.* The method of preparing such vaccines, and the immunising schedule, have been previously described for blood-group-A substance (Glynn et al. 1956). Antisera prepared in this way precipitated specifically with serial dilutions of Lewis^a substance up to 1 : 100,000 and gave no cross-reactions with solutions of other available blood-group substances (A, B, H, HLe^b).

Preparation of Saliva for Precipitin Test

Saliva was collected in clean screw-capped glass containers. Aids to secretion were not used. The containers were immersed in boiling water for ten minutes within two hours after collection and subsequently kept at 0°C until tested. This prevented bacterial decomposition of the blood-group substances. For testing, portions of saliva were transferred to 3 × $^3/_8$ in. tubes and centrifuged until the supernatant fluid was clear. Precipitin tests were set up in capillary tubes by the method of Swift et al. (1943). Tests were incubated for one hour at 37°C.

After incubation, positive tests showed a heavy white precipitate, some of it settling to the bottom of the capillary tube. Only tubes showing such unmistakable abundant precipitation were accepted as positive. Most other salivas gave no precipitate, the solution in the capillary tube remaining clear. Some negative salivas showed traces of precipitate, particularly after overnight refrigeration. Grubb (1951) and Ceppellini (1955) have shown that a high proportion of A, B, H secretors nevertheless secrete small quantities of Lewis^a substance in addition. Probably, therefore, the salivas giving traces of precipitation with anti-Le^a serum came from persons in this group. Under the standardised conditions of the precipitin test, however, readings being made after one hour's incubation only, the strongly reacting salivas were consistently distinguishable from those giving only a trace of precip.tation.

Selectivity of Rabbit Anti-Le^a Serum

The Lewis red-cell phenotype of 5 out of 19 normal adults was Le(a+b−), and of 14 Le(a−b+).† Saliva samples from this group were tested by the precipitin method, which gave unequivocal positives with the 5 Le(a+) samples and no reaction with the remainder.

* A purified preparation of Le^a substance was kindly given by Prof. W. T. J. Morgan.

† These were kindly tested by Dr. A. E. Mourant, of the Lister Institute, London.

TABLE I—COMPARISON OF RESULTS OBTAINED BY AGGLUTINATION-INHIBITION TEST AND SALIVA PRECIPITIN TEST FOR DETERMINING SECRETOR STATUS

ABO phenotype	No. of persons	Saliva: inhibition of α and/or β iso-agglutinin	Saliva: precipitation with anti Le^a serum	Total positive
A	95	77	17	94
B	11	7	3	10
AB	9	6	3	9
Total	115	90	23	113*

*1 group-A person, 1 group-B person } Saliva agglutination-inhibition negative and precipitation with anti-Le^a serum negative.

These results suggested that only saliva from persons with Le(a+) red cells—i.e., most A, B, and H non-secretors—gave positive precipitin tests with the rabbit antisera. This hypothesis was tested as follows:

Saliva from 115 hospital patients (63 with rheumatic fever meeting the criteria of Duckett Jones [1944], 12 with rheumatic fever not meeting these criteria, 29 with rheumatoid arthritis, and 11 miscellaneous cases) was examined for the presence of A and/or B substance by the standard hæmagglutination-inhibition titration-test, and for precipitation with rabbit anti-Le sera.

This group of cases excluded group-O individuals, whose saliva could not be tested by the hæmagglutination-inhibition test.

The results are given in table I, which shows that all except 2 were positive by one or other test, that none were positive by both tests, and that the anti-Le^a serum detected 23 out of 25 non-secretors of A and/or B substance. Grubb and Morgan (1949) found that all but 2 out of 59 A, B, H non-secretors had red cells Le(a+); similar figures (1 out of 49) are given by Race et al. (1949). These three discrepancies probably fall into the red-cell group Le(a−b−). It is thought that the 2 cases described above (secreting neither A, B, H substances nor Le^a substance) fall into the same category; the Lewis red-cell phenotype of one (group-B) could not be determined, but that of the other (group-A) was Le(a−b−). It

TABLE II—RED-CELL PHENOTYPE DETERMINED BY TWO METHODS IN PATIENTS WITH RHEUMATIC FEVER

Saliva phenotype		No. of persons	Total with presumed red-cell phenotype
A and/or B substance	Le^a substance		
Not tested	Absent	236	323 Le(a−b+)
Present	Absent	50	
Present	Not tested	37	
Not tested	Present	86	125 Le(a+b−) (*124*)*
Absent	Present	16	
Absent	Not tested	23 (*22*)*	
Absent	Absent	2	2 Le(a−b−)
	Total		450

*Corrected figure. See text.

appears, therefore, that the saliva precipitin test used in the present work detects people with Le(a+) red cells. On the basis of these figures 3·75% (2/59+1/49+2/25) of A, B, H non-secretors do not secrete Le^a substance in their saliva and will not be detected by the precipitin test.

Determination of A, B, O Blood-groups

Blood taken routinely for other investigations was used for A, B, O grouping in the hospital pathological laboratory as part of the normal blood-grouping service.

Selection of Cases

The cases tested consisted of:

450 proved cases of rheumatic fever (active or inactive). These were diagnosed according to Duckett Jones's (1944) criteria, excluding "pure" chorea.

250 cases of rheumatoid arthritis, seen either at Taplow or Hammersmith Hospital.

460 healthy school-children selected from the local area and in age and sex similar to the rheumatic-fever group.

Results

Of the 460 school-children tested by the precipitin method 100 (21·7%) were Lewis[a] positive.

The results in the rheumatic-fever patients are given in table II, which shows the findings by the two methods used either singly or together. 102 out of 388 tested by the precipitin method were Lewis[a] positive. 23 out of 60 tested by the hæmagglutination-inhibition test were non-secretors. 2 patients had neither Le[a] substance nor hæmagglutination-inhibiting (A, B, H) substances in their salivas.

The results in patients with rheumatoid arthritis are shown in table III. They are similar to those found in healthy school-children.

TABLE III—RED-CELL PHENOTYPE IN HEALTHY SCHOOL-CHILDREN, RHEUMATOID ARTHRITIS, AND RHEUMATIC FEVER

—	Red-cell phenotype		Total	% Le(a+)
	Le(a–)	Le(a+)		
Healthy school-children	360	100	460	21·7
Rheumatoid arthritis..	203	50	253	19·8
Rheumatic fever ..	326	124	450	27·6

cf. Rheumatic fever with healthy school-children $\chi^2 = 4{\cdot}01$, n = 1, p = <0·05.

A, B, O Distribution

Blood-group frequencies in 447 of the 450 rheumatic-fever patients tested for Lewis group and in an additional 78 rheumatic-fever patients not so tested are shown in table IV, which also gives the A, B, O frequencies in the 209 rheumatoid-arthritics whose blood-groups were determined. For comparison the frequencies in 15,046 groupings done routinely in this hospital from January, 1948, to September, 1955, are also shown. More than half of these represent antenatal-clinic cases, and all of them are drawn from the population of the Thames valley. Table V shows the distribution of Lewis groups among the four main A, B, O groups in the patients with rheumatic fever and those with rheumatoid arthritis.

Comparison of Frequencies of Non-secretors in Healthy School-children and Rheumatic-fever Patients

To compare the rheumatic-fever and control series the former must be corrected to exclude the small proportion (3·75%) of A, B, H non-secretors who are also non-secretors of Le[a] substance (see above). If this correction

TABLE IV—A, B, O BLOOD FREQUENCIES IN CONTROLS, RHEUMATOID ARTHRITIS, AND RHEUMATIC FEVER

—	Blood-group				Total
	O	A	B	AB	
General hospital patients	6775 (45·03%)	6456 (42·91%)	1311 (8·71%)	504 (3·35%)	15,046
Rheumatoid arthritis	95 (45·5%)	86 (41·1%)	22 (10·5%)	6 (2·9%)	209
Rheumatic fever ..	213 (40·6%)	223 (42·5%)	57 (10·9%)	32 (6·1%)	525

TABLE V—DISTRIBUTION OF LE(a+) PERSONS AMONG A, B, O GROUPS

—	Presumed red-cell phenotype	Blood-group					Total
		O	A	B	AB	Not tested	
Rheumatic fever	Le(a–)	127	141	40	16	1	325 (*326*)*
	Le(a+)	40	57	13	13	2	125 (*124*)*
	Total	167	198	53	29	3	450
	% Le(a+)	24·0	28·8	24·5	44·8	..	27·6
Rheumatoid arthritis	Le(a–)	69	70	17	2	45	203
	Le(a+)	19	14	5	2	10	50
	Total	88	84	22	4	55	253
	% Le(a+)	21·6	16·7	22·7	..	..	19·8

* Corrected figure. See text.

is applied to the number (23) of A, B, H non-secretors in whom Le[a] secretion was not tested, the figures for Lewis[a] positives in table II become:

$$86 + 16 + 23\left(1 - \frac{3{\cdot}75}{100}\right) = 124.$$

It is then possible to make a direct comparison between the rheumatic-fever and control groups as regards the frequency of Lewis[a] positives. There is a higher frequency of Lewis[a] positives in rheumatic-fever patients (27·6%) than in healthy school-children (21·7%). For this comparison $\chi^2 = 4{\cdot}01$, n = 1, p = >0·02<0·05.

Table VI shows the incidence of Lewis[a] positives in consecutive groups of 50 rheumatic-fever cases. It will be seen that in the penultimate group of 50 the incidence is considerably reduced. We cannot at present explain this discrepancy which was not found in the latest group of 50 except on the basis of chance selection.

There was no variation in the proportion of Lewis[a] positives with age or sex in the healthy controls, the rheumatic-fever patients, or the rheumatoid arthritics. In the rheumatic-fever group no relationship to rheumatic activity was found.

Table V suggests that the significant preponderance of non-secretors in rheumatic fever occurs principally in

TABLE VI—%LE(a+) IN SUCCESSIVE BATCHES OF 50 CASES OF RHEUMATIC FEVER

Batch no.	1	2	3	4	5	6	7	8	9
Le(a+)	17	16	13	15	13	18	14	6	13
% Le(a+)	34	32	26	30	26	36	28	12	26

blood-groups A and AB, but at present the numbers investigated are too small to substantiate this. There is no suggestion of this trend in the 200 rheumatoid arthritics (tables IV and V), in whom the over-all incidence of Lewis positives (19·8%) was not significantly different from that in the healthy controls.

Discussion

It should be emphasised that the precipitin test described above detects only those persons whose saliva contains large quantities of Le[a] substance—i.e., about 97% of A, B, H non-secretors. It therefore, in effect, detects persons whose red-cell phenotype is Le(a+b–). The remaining 3%, as pointed out by Grubb and Morgan (1949), secrete neither A, B, H nor Le[a] substances and are probably of red-cell phenotype Le(a–b–). It follows that, to obtain an estimate of A, B, H non-secretors in a population, the percentage positive by the saliva precipitin

test must be multiplied by the factor 100/96·25=1·04. With this correction the incidence of non-secretors in our healthy controls is 22·6%, which agrees closely with the estimate of just over 22% by Race and Sanger (1954). The corrected incidence in our rheumatic-fever patients is 28·7%, which is significantly higher at the 5% probability level.

Fraser Roberts and Thomson (1934) and Wilson and Schweitzer (1954) have adduced evidence for a hereditary factor in rheumatic fever, and the results we have obtained support this concept, since secretor status is genetically determined (Schiff and Sasaki 1932).

Our interest in secretor status arose from the results of our previous work (Glynn and Holborow 1952a and b), which suggested the possibility that, during the streptococcal throat infection that precedes an attack of rheumatic fever, some haptenic material in the throat secretions is absorbed on to the micro-organisms and thus rendered completely antigenic. According to this hypothesis it seemed reasonable to anticipate that a difference would exist between the secretor status of persons with and without rheumatic fever. The hypothetical hapten might be related to the A, B, H series of substances and thus only be found in the saliva of secretors, or it might be related to the Lewis[a] substance and only be found in the saliva of non-secretors. A third possibility would be that the secretion of the hapten is not completely correlated with either group alone but more with one than the other. If this were so, rheumatic fever would not be confined completely to secretors or non-secretors but would show a statistically significant correlation with one or the other.

In view of the hypothesis which led to this work, suggesting a correlation between rheumatic fever and the composition of the throat secretions, our findings are all the more significant.

It is essential for the firm establishment of the hypothesis that the results we have so far obtained be confirmed or refuted by a more extensive investigation, including a family study, which we are now undertaking.

Summary

The low incidence of rheumatic fever following streptococcal infections of the throat emphasises the importance of host factors.

One important variation in the environment of the streptococcus in the throat depends on the secretor status of the host as regards blood-group substances.

A simple method of determining secretor status is described, based upon the detection of Lewis[a] substance in the saliva by precipitation with a rabbit anti-Lewis[a] serum.

The incidence of Lewis[a] positives in 460 school-children used as controls was 21·7%. The incidence among 450 children with rheumatic fever was 27·6%. This difference is significant at the 5% level.

We are extremely grateful to Dr. R. R. Race, Dr. Ruth Sanger, and Dr. J. A. Fraser Roberts for their advice. Our thanks are also due to the Buckinghamshire Education Authority and the local school-children for their coöperation.

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AN INVESTIGATION INTO BRONCHITIS

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PERSISTENT or intermittent cough is an invariable symptom of chronic bronchitis, but a history of cough often precedes the diagnosis of the disease by many years. An investigation was recently made at the Central Middlesex Hospital to trace causes of this cough.

Patients were interviewed to ascertain the age and mode of onset of the chronic bronchitis and the part played by the following factors in the development of the chronic cough: familial tendency to respiratory disease, infection, social factors, occupation, smoking, and atmospheric pollution.

Material

100 patients with chronic bronchitis and 100 control patients were interviewed; each interview took about forty-five minutes. The marriage partner or close friend of the first 50 patients in the two groups was also interviewed for amplification of the patient's story.

A patient was considered to have chronic bronchitis when there was clinical and radiological evidence of a progressive affection of the bronchial tree with cough, expectoration, and dyspnœa, the course of which was punctuated by exacerbations of symptoms due to infection or to chemical or physical agents.

The patients with chronic bronchitis were consecutive inpatients admitted to the Central Middlesex Hospital between March, 1954, and January, 1955, who were treated for exacerbations of that condition or lung complications needing antibiotic therapy. The following exceptions were made: (1) patients too ill to give a detailed history; (2) patients aged more than 70, because they were found in a pilot survey to be unable to give an accurate account of their previous illnesses and early social environment; and (3) patients with known bronchiectasis, pneumoconiosis, active pulmonary tuberculosis, or diseases of other systems giving similar symptoms.

The controls were inpatients in the medical, surgical, and gynæcological wards of the Central Middlesex Hospital of similar age and sex who on clinical and radiological examination showed no evidence of chronic bronchitis or emphysema, and on direct questioning considered that they did not have bronchitis. Other chest diseases, however, such as lobar pneumonia and carcinoma of the bronchus, did not exclude them from the investigation.

Age and Mode of Onset of the Chronic Bronchitis

The age at which chronic bronchitis was diagnosed is given in table I. 15 of the patients were aged less than 30. (This age assessment was corroborated in the first 50 cases by the marriage partner or close friend.)

23 patients said that the chronic bronchitis was diagnosed when they first developed a persistent cough.

TABLE I—AGE OF 100 PATIENTS WHEN CHRONIC BRONCHITIS WAS DIAGNOSED

Age (yr.)	Males	Females
0–9	1	0
10–19	2	2
20–29	8	2
30–39	11	6
40–49	30	7
50–59	19	7
60–69	3	2
Total	74	26

The other 77 patients, however, said that they had had a persistent or intermittent cough for various periods before chronic bronchitis was diagnosed. The average duration of this "pre-bronchitis cough" was 14 years. In the first 50 cases the average time was 14·5 years, compared with an average of 15 years given by the marriage partner or close friend. These 77 patients had continued to cough without seeking or obtaining adequate investigation or treatment; at the end of this period they were diagnosed as having an irreversible lung condition.

Causes of Cough

Familial Tendency to Respiratory Disease

54 of the 100 chronic bronchitics said that one or more of their parents or siblings had a chronic cough. This figure includes 11 of the 15 patients whose bronchitis was diagnosed before they were aged 30. 34 controls gave a similar family history.

Infection

21 patients dated their chronic bronchitis and 10 their "pre-bronchitis cough" from a major respiratory illness; in 16 patients this illness was pneumonia, in 3 it was pleurisy, and 4 had had chest complications following abdominal operations. It seemed to these patients that the illness left them with a cough and other chest symptoms which slowly became worse until chronic bronchitis was diagnosed.

The occurrence of head colds in the two groups was investigated. The chronic bronchitics not only had more head colds than did the controls, but also the colds lasted longer and were more often associated with a cough. At the time of the investigation 63 bronchitics, compared with 29 controls, regularly had three or more colds each year, and in 57 bronchitics and 37 controls the colds lasted on an average more than a week. 63 bronchitics, but only 15 controls, developed a cough with every head cold. 51 chronic bronchitics said that, even before the bronchitis was diagnosed, they always got a cough which lasted from one to four weeks whenever they had a head cold. This cough was often productive, the sputum sometimes becoming purulent.

The following list gives the past illnesses of the patients in the two groups:

	Chronic bronchitics	*Controls*
Whooping-cough	30	27
Measles	46	53
Pneumonia	53*	16
Pleurisy	27*	5
Asthma	20*	1
Pulmonary tuberculosis	7	3
Sinus infection	9	6
Aural discharge	11	10

* 34 patients had had pneumonia and 10 had had pleurisy after chronic bronchitis was diagnosed. 12 patients with asthma developed the condition after chronic bronchitis was diagnosed, and 7 others said that when they first sought advice for their asthma they were told that they were suffering from chronic bronchitis as well.

Social Factors

The subject of cross-infection in the household was investigated. 33 bronchitics said that in childhood there were members of the same household with a chronic cough; 19 controls lived in similar conditions. At the time of the investigation 20 bronchitics and 23 controls were housed with people with chronic coughs.

Only 3 chronic bronchitics considered that housing-conditions had any direct bearing on their chest disease. 55 bronchitics and 52 controls in childhood regularly lived in homes where there was less than one living-room per person. At the time of the investigation there were 10 bronchitics and 9 control patients in similar living-conditions.

Occupation

Inquiry about the occupation of the chronic bronchitics at the time of onset of the "pre-bronchitis cough" showed that 17 patients were still at school and 7 were in the Armed Forces.

46 chronic bronchitics considered that they were working in dusty or fume-polluted atmospheres; 37 controls thought that their work conditions were similarly affected. Only 21 bronchitics, however, thought that conditions at work were a cause of their cough; 11 of these patients did not blame the atmospheric pollution but considered the responsible factor to be the draughts in the factory and sudden changes of temperature on going out of doors from a warm building in winter.

TABLE II—NUMBER OF CIGARETTES SMOKED BY 100 CHRONIC BRONCHITICS AND 100 CONTROLS
(1 oz. tobacco = 30 cigarettes)

	Non-smokers	Less than 50,000	50,000–100,000	100,000–150,000	150,000–200,000	200,000–300,000	More than 300,000
Chronic bronchitics	9	5	11	16	23	22	14
Controls	22	10	18	18	11	16	5

Smoking

The smoking habits of the two groups were compared. 9% of the bronchitics and 22% of the controls were non-smokers. 20 of the 26 women bronchitics smoked, compared with 12 of the 26 women controls. An attempt was made to assess the total number of cigarettes smoked by each patient, irrespective of the consumption at the time of the interview. The numbers are given in table II. Of the 24 patients in each group under the age of 50, 14 bronchitics and 6 controls had smoked more than 100,000 cigarettes. In the whole group nearly twice as many chronic bronchitics had smoked more than 150,000 cigarettes, compared with the controls (59 : 32); this is the equivalent of smoking 20 cigarettes a day for more than twenty years, or at present-day prices an expenditure of about £1000 on tobacco.

56 chronic bronchitics and 33 controls said that they had a smokers' cough. 21 of these 56 bronchitics said that, when they had completely abstained from smoking for at least a month, their cough was noticeably less. 47 bronchitics were smoking less at the time of the interview than when the chronic bronchitis was diagnosed.

21 bronchitics claimed that the early morning cigarette was a useful expectorant. 1 patient said that his cough was worse after he stopped smoking, because it then took him longer to clear his chest in the morning.

An attempt was made to assess the effects on respiratory symptoms of different makes of cigarettes; this proved impossible. Most patients tolerated a particular brand to which they had become accustomed either through habit or financial reasons, even though that brand was popularly regarded as "strong," and were often adversely affected by other brands considered "mild."

Atmospheric Pollution

The patients in this survey lived in North-west and West London, mainly in the boroughs of Willesden, Acton, Ealing, and Wembley. A significantly larger number of bronchitics (23 : 13) had lived within half a mile of a gasworks or power station for at least three years immediately before the interview. 12 bronchitics and 9 controls in childhood had lived in similar localities for a similar time.

78 of the bronchitics said that they regularly got respiratory embarrassment, such as increased cough, dyspnœa, and asthma, during a fog, and 9 had learnt by experience never to leave home in a fog. 33 controls usually had respiratory distress during fogs.

TABLE III—EFFECT OF LONDON FOG OF DECEMBER 1952 ON 100 CHRONIC BRONCHITICS AND 100 CONTROLS

Time off work	Chronic bronchitics			Controls		
	1–7 days	1–4 weeks	More than 4 weeks	1–7 days	1–4 weeks	More than 4 weeks
Treated at home	5	12	7	1	..	1
Treated in hospital	..	3	6	..	..	..
Already ill and worse as result of fog	..	5	2	..	..	..

The great London fog of December, 1952, caused the death of 4000 people and much invalidism (Ministry of Health 1954). 33 of the 100 chronic bronchitics in this survey were off work with chest illnesses dating from the fog, for periods ranging from one day to seven months (table III).

30 of the 33 were normally in gainful employment, and between them they lost more than 1200 days' work. 9 other bronchitics were already sick when the fog began, and 7 of them had increased chest symptoms; 1 of them (now aged 56) has not worked since. The 2 who were not adversely affected were already in hospital when the fog started; 1 man was in an oxygen tent and refused to come out of it until the fog had dispersed. 2 other bronchitics, who were not off work at the time of the fog, considered that their chest condition has been worse since that time, and another man attributed all his bronchitis to that particular fog.

Among the controls 1 man was off work for a day with a bad cough, and another man developed pneumonia and was off work for seven weeks: he had not had any chest illness before and has remained well since.

Discussion

Chronic bronchitis is now the major problem in respiratory disease in this country. In 1951 over 26,000,000 working-days were lost among the insured population of England and Wales because of bronchitis. In males this was 10% of the total days lost because of ill health; in females it was 6%. In the present series 66 of the 100 bronchitics were in gainful employment; between them they lost more than 3800 working-days as a result of their bronchitis in the twelve months immediately before this investigation. This is an average of nearly 9 weeks per person, and it does not include the illness which caused their admission to hospital at the time of the interview.

Pattern of Development of Chronic Bronchitis

The onset of bronchitis in these patients was usually insidious; winter head-colds became associated with cough, which sooner or later produced sputum, usually mucoid but sometimes purulent. The head-colds became more frequent, occurring in the summer months as well, and the cough lasted longer with each episode. The sputum more often "came from the chest." Sinus and aural infections occasionally perpetuated the symptoms. In addition, an aggravating factor of cough throughout the year in half the patients was smoking, and in 3 of every 4 patients winter fogs eventually caused respiratory distress as well. These symptoms lasted, on an average, fourteen years before chronic bronchitis was diagnosed. By this time dyspnœa on mild exertion was present in 40% of cases. The later stages of the disease were characterised by persistent cough and expectoration of mucoid sputum, and increasing dyspnœa, with more frequent exacerbation of symptoms due to infection or to chemical or physical agents.

Some patients said that one particular episode, such as pneumonia and pleurisy, had converted them from healthy people to chronic bronchitics. Many of these patients, however, gave a long history of cough before the infection, but their chest symptoms became progressively worse from that time.

The constant symptom in bronchitis is cough. Christie (1952) has pointed out that the violent pressure-changes to which the delicate alveoli are subjected may lead eventually to loss of pulmonary elasticity. The damaged lung tissue becomes more susceptible to the cough resulting from any of the factors previously discussed. Between the onset of the head-colds associated with cough and the fully developed picture of chronic bronchitis and emphysema there must be a stage when the changes in the respiratory system are still reversible and the damage not permanent—a period when investigation of the cause of the cough followed by its treatment might stop the cough and prevent its recurrence.

In all the cases of bronchitis in this investigation there was more than one causal factor. The greater incidence of chronic cough among the parents and siblings of the bronchitics suggests a hereditary predisposition, and this is in keeping with the findings of Oswald et al. (1953). 7 of the 15 patients in whom chronic bronchitis was diagnosed before the age of 30 had severe emphysema.

Infection played a major rôle. It was noted that chemotherapy and antibiotics were not often used to treat respiratory infections in the stage of the "pre-bronchitis cough"; yet, once permanent lung damage had been diagnosed, these drugs were commonly used.

Palmer (1954) and Oswald and Medvei (1955) have shown that the incidence of chronic bronchitis is significantly higher among smokers. The figures in this investigation also show that it is higher among heavy smokers. The person who has smoked more than 20 cigarettes a day for many years almost always coughs when he smokes. Abbott et al. (1953), who investigated the ætiology of severe emphysema, found that smoking more than 20 cigarettes a day was common. Most smokers are still prepared to accept the risk of developing an incurable chest disease, but the cigarette which causes a cough is doing harm, even though it may also help to remove the mucus it has caused by irritation.

The prevention of atmospheric pollution is a national issue, and its effects on respiratory illness will not be apparent for many years. Almost all forms of dust and fumes will cause respiratory distress if inhaled in sufficient concentrations, and the threshold depends on the susceptibility of the individual respiratory passage. Those who are affected by fogs and fumes are best advised to avoid them by moving from the polluted area or alternatively keeping indoors for the duration of fogs.

The lowering of the incidence of chronic bronchitis must depend on the early treatment of the "pre-bronchitis cough," which starts at an early age (17% of the patients were still at school). The chemical and physical causes of the "pre-bronchitis cough" are nearly all preventable or avoidable. Bacterial infections of the respiratory tract and lungs can now be treated by chemotherapy or with antibiotics with every chance of curing the infection, providing they are used at the stage when the underlying lung tissue has not been damaged by previous disease. Too rapid a return to work after these infections makes dissemination of the infection probable and also a reinfection of the still susceptible respiratory tract of the patient by contact with the dust, smoke, and bacteria-laden atmosphere of public transport and places of work.

Summary

An investigation was made to ascertain the age and mode of onset of chronic bronchitis in 100 patients, and to trace the part played by different factors in the development of chronic cough.

77 patients with chronic bronchitis had had a persistent or intermittent cough for, on an average, fourteen years before bronchitis was diagnosed.

During the period of the "pre-bronchitis cough" recurrent infections, such as head-colds complicated by cough and the expectoration of mucoid or purulent sputum, played a large part in the maintenance of this cough.

59 chronic bronchitics had smoked more than 150,000 cigarettes.

78 bronchitics regularly had respiratory distress in fog.

The avoidance of chemical and physical causes of cough, together with a more active treatment of respiratory-tract infections in the "pre-bronchitis cough" stage, may help to lower the incidence of what is now the major problem in respiratory disease in this country.

I wish to thank Dr. Horace Joules for much help and encouragement during this investigation, and the consultant staff of the Central Middlesex Hospital for access to the patients.

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AMIPHENAZOLE IN OBSTETRIC ANALGESIA

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MORPHINE has long been accepted as the drug of choice in the management of long and painful labour; but it stimulates the vagal centre, causing nausea in 30% of cases and vomiting in 10%, and readily crosses the placenta into the fœtal circulation, sometimes causing fatal apnœa.

Pethidine, which has largely been substituted for morphine in obstetrics, has only a slight depressing effect on the respiratory centre of the fœtus and has good analgesic properties, but it lacks the desirable sedative and euphoric effects of morphine.

Consequently a drug has been sought which will selectively antagonise the respiratory depression of morphine without reducing analgesia. Amiphenazole (2 : 4-diamino-5-phenylthiazole hydrochloride) possesses this property to a striking degree. It is a colourless crystalline compound readily soluble in water and in physiological saline solution, but the solution slowly decomposes at room-temperature and should be used within twenty-four hours.

Intravenous Assay

The severity of pain tends to increase with the progress of labour, but great variation is found from one patient to another and in the same patient at different stages of her labour. To overcome this difficulty and to obtain comparable results analgesic drugs were added to physiological saline solution and given by continuous intravenous infusion. Each drug was administered for not less than thirty minutes, and the rate of infusion was adjusted to obtain a similar analgesic action. The dose given was sufficient to reduce the pain to that equivalent to mild dysmenorrhœa, and no attempt was made to eliminate the pain completely. Between each period of thirty minutes physiological saline solution alone was given, until analgesia had become appreciably diminished, before introducing the next drug. The patients selected were mainly young primigravidæ in normal labour, and the assay was begun when the cervix was dilated to 3 cm. Pethidine, morphine and a morphine-amiphenazole mixture were compared, and in many cases it was possible to administer each of the drugs twice during the same labour.

Although the amount of drug required varied considerably from patient to patient—e.g., pethidine 30–80 mg. per hour—the relative analgesic effect of the drugs proved consistent. Pethidine 150 mg. was found equivalent to morphine gr. $^1/_4$. When amiphenazole 30 mg. was added to morphine gr. $^1/_4$, its analgesic effect was only very slightly reduced and was found to be equivalent to that of pethidine 130 mg.

Clinical Trial

Morphine gr. $^1/_2$ and amiphenazole 30 mg. were given by intramuscular injection to 20 patients in strong labour with the cervix dilated more than 3 cm. 6 of these patients were delivered within two hours, and 5 of the babies cried immediately. 9 of the patients were delivered from five to seven hours after the injection, and 6 of their babies had difficulty in breathing and became cyanosed; and 9 babies of the 20 patients receiving the mixture showed definite but reversible respiratory depression.

From this preliminary trial it was concluded that the action of amiphenazole is less prolonged than that of morphine, and its duration of effective action is probably about four hours.

30 other patients were given morphine gr. $^1/_4$ and amiphenazole 30 mg. If the cervix became fully dilated within eight hours, a further dose of amiphenazole 30 mg. was given by intramuscular injection. Only 4 of the babies became cyanosed and showed evidence of respiratory depression. Each of these depressed babies received amiphenazole 3 mg. intravenously into the umbilical vein, and respiration was fully established within six minutes of birth (Holmes 1956).

Of the 50 patients in the trial only 1 developed vomiting attributable to morphine, and 6 others, who normally vomited after morphine, experienced mild nausea only. Slowing of maternal respiration was not observed. Narcosis was greater than after pethidine but was much less than after morphine used alone, and coöperation was maintained during the second stage of labour. Twenty-four hours after delivery patients were closely questioned and found to have more amnesia than after pethidine. The uterine contractions became less frequent but were not reduced in strength, and the progress of labour and cervical dilatation appeared to be accelerated.

Amiphenzaole is apparently harmless; healthy volunteers have received up to 300 mg. intravenously (McKeogh and Shaw 1956). No adverse side-effects were observed in the present series.

Conclusions

Amiphenazole much reduces the undesirable qualities of morphine without significantly reducing its analgesic action on the mother.

In the doses recommended amiphenazole can reduce, but will not completely eliminate, neonatal apnœa caused by morphine.

Nevertheless the threat of fatal neonatal apnœa has been effectively removed, and morphine can now be used more freely in hospital midwifery practice.

I am indebted to the manufacturers, Messrs. A. and G. Nicholas Ltd., for the amiphenazole used in this trial.

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Reviews of Books

Subarachnoid Hæmorrhage

JOHN N. WALTON, M.D., M.R.C.P., first assistant in neurology, King's College, University of Durham, in the Royal Victoria Infirmary, Newcastle upon Tyne. Edinburgh: E. & S. Livingstone. 1956. Pp. 350. 30*s*.

MANY papers on subarachnoid hæmorrhage have appeared since the classical descriptions of the condition by Collier and by Symonds (who has written a foreword to this book) in 1922 and 1923. This appears to be the first monograph on the subject, although there have been several on the related topic of intracranial aneurysm.

The book is based on an extensive review of the literature and on a series of 312 cases admitted to the Royal Victoria Infirmary, Newcastle upon Tyne. Only a small proportion of this series was seen personally by the author in the acute stage of the illness, and unfortunately the great majority of the patients were admitted before the valuable diagnostic technique of angiography was brought into routine use. The surgical treatment of the vascular anomalies which cause subarachnoid hæmorrhage is a topic of great interest and complexity; but, although the subject is considered at some length, it would seem that the author has had little personal experience of cases treated surgically, and in future editions collaboration with a neurosurgeon would enhance the usefulness of the monograph. This book will be of real value as a clear and detailed account of the clinical and pathological features of subarachnoid hæmorrhage, and for the thorough survey of the literature; and, as Dr. Walton points out, the Newcastle series may be a useful yardstick for comparison with future series investigated and treated by more modern methods. The illustrations are good, and there is an exhaustive list of references.

Tuberculosis in Obstetrics and Gynæcology

GEORGE SCHAEFER, M.D., F.A.C.S., assistant professor of clinical obstetrics and gynæcology, Cornell University Medical School, New York. Boston: Little, Brown. London: J. & A. Churchill. 1956. Pp. 307. 63*s*.

THIS excellent little book can be warmly commended to all interested either in tuberculosis or in obstetrics and gynæcology.

The work is in two sections, the first dealing with tuberculosis in obstetrics and the second with genital tuberculosis. Views are concisely and clearly expressed, and illustrations have been carefully selected and beautifully reproduced. References are included for those who wish to read further. The problem of tuberculosis in pregnancy is carefully assessed; and the author declares that segmental resection or pneumonectomy should, when otherwise indicated, be performed even during pregnancy. The problem of therapeutic abortion is succinctly and critically reviewed. The subject of genital tuberculosis is admirably summarised in part two of the book.

Dr. Schaefer is to be congratulated on his well-timed contribution to this important subject.

Treatment of Heart Disease

A Clinical Physiologic Approach. HARRY GROSS, M.D., F.A.C.P., assistant clinical professor of medicine; ABRAHAM JEZER, M.D., assistant clinical professor of medicine, Columbia University College of Physicians and Surgeons. Philadelphia and London: W. B. Saunders. 1956. Pp. 549. 91*s*.

THE authors describe this book as "a presentation of therapy in heart disease based upon sound physiologic principles."

The first part of the book deals with the mechanisms of disordered cardiac function and the treatment of congestive heart-failure, and includes chapters devoted to digitalis and quinidine. Subsequent parts cover the whole field of cardiology. A complete section is devoted to surgery in the cardiac patient, and the last part deals with the psychosomatic aspects of heart-disease and with reablement. Each chapter is followed by a lengthy bibliography, and there is a good index.

The illustrations would be of greater value if reference were made to them in the text, to illustrate specific points; the meaning of the wording in the text is not always clear, and there are occasional contradictions; and it is unfortunate that the results of special investigations are sometimes included at length at the expense of the clinical findings (this is especially striking in the section on selection of patients for mitral valvotomy). But this comprehensive work contains a great deal of important information which will prove of value to many physicians.

Clinical Urology

3rd ed. OSWALD SWINNEY LOWSLEY, M.D., F.A.C.S. THOMAS JOSEPH KIRWIN, M.D., F.A.C.S. Baltimore: Williams & Wilkins. London: Baillière, Tindall, & Cox. 1956. Vol. I, pp. 464; vol. II, pp. 520. £12 12*s*. (the set).

FOR the third edition of this imposing treatise the text has been thoroughly revised and brought up to date. The superb illustrations by William Didusch eliminate the need for much descriptive writing; indeed, so copious are the illustrations that the two volumes constitute an atlas of urological pathology and surgical technique in addition to a comprehensive clinical guide.

Volume I is concerned with general methods of urological investigation and a detailed study of the genito-urinary organs from penis to prostate, which volume II continues in ascending order from the bladder to the kidneys and adrenal glands. Each clinical section deals first with the embryology, anatomy, and physiology of the part before the anomalies, injuries, and diseases which may affect it are considered.

The new edition includes an outstanding chapter on endoscopic examination of the urinary tract. The well-known ingenuity of the authors in devising instrumental and practical surgical techniques permeates the whole work and perhaps constitutes a danger; for the impression of simplicity conveyed by the accompanying illustrations might in some cases affect the judgment of the novitiate. The emphasis on operative procedures is counterbalanced by the inclusion of excellent sections on the treatment of anuria, endocrinology in relation to the urogenital tract, and chemotherapy and antibiotics in urological practice.

The Practice of Psychiatry in General Hospitals

A. E. BENNETT, M.D., associate clinical professor of psychiatry, University of California; EUGENE A. HARGROVE, M.D., assistant professor of psychiatry, University of North Carolina; BERNICE ENGLE, M.A., research associate, department of psychiatry, University of California. Berkeley and Los Angeles: University of California Press. London: Cambridge University Press. 1956. Pp. 176. 30*s*.

GENERATIONS of psychiatrists have re-discovered and preached the need for understanding and treating the mentally sick person in terms of the integration of mind and body; but until quite recently public opinion encouraged the old dichotomy by insisting on the segregation of the mentally sick. Now that the tide is turning and tolerance and understanding are replacing fear and prejudice, the medical profession should take the opportunity to organise an integrated service; such is the theme of this book. Though the principles laid down by the authors are as applicable in this country as in the U.S.A., little of the detailed planning is relevant here, because of differences in laws and customs and particularly because we have a National Health Service.

Infant Feeding (2nd ed. London: Edward Arnold. 1956. Pp. 30. 2*s*.).—This booklet by Prof. Alan Moncrieff was first published in 1940, and a second edition appears eight years after the last reprint. It deals in a very sensible way with breast-feeding, bottle-feeding with cow's milk (liquid, dried, and condensed), weaning to full infant diet, and the feeding of the premature infant. It can be confidently recommended both to intelligent mothers and to their medical and non-medical advisers.

Adolescence (London: National Association for Mental Health. 1956. Pp. 12. 1*s*. 6*d*.).—This excellent 12-page booklet for parents, written by Isobel Stirling, is directed towards the wise and sympathetic handling of adolescent sons and daughters and their emotional problems.

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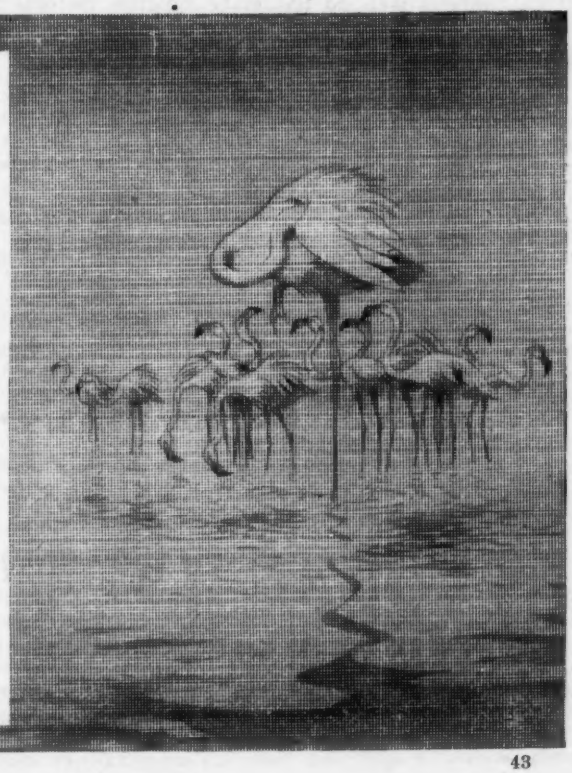

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THE LANCET

LONDON: SATURDAY, OCT. 13, 1956

Myopathy and Scrapie

THE discovery of a widespread myopathic disease in sheep, recorded by Dr. BOSANQUET, Dr. DANIEL, and Mr. PARRY in this issue, opens up a new view of the spontaneous degenerations of skeletal muscle.

The group of human diseases whose principal lesion is a muscle degeneration or myopathy includes the muscular dystrophies, dermatomyositis (polymyositis), and the myopathies associated with carcinoma and thyroid dysfunction. Muscular dystrophy was first recognised over a hundred years ago, when ARAN [1] and MERYON [2] showed that it is primarily a disease of muscle and therefore distinct from muscular atrophy caused by lesions of the spinal cord or motor nerves. During the second half of the 19th century many forms of muscular dystrophy were described, notably the facioscapulohumeral form of DUCHENNE,[3] the juvenile type of LANDOUZY-DÉJÉRINE [4] and ERB,[5] and the distal form of GOWERS [6]; but in spite of the many apparently different clinical types, GOWERS [7] drew attention to their similarities, and ERB [8] regarded them as expressions of a single disease, which he termed dystrophia musculorum progressiva. In recent years there have been several attempts to classify the various clinical varieties,[9–11] but many intermediate forms [12–15] are hard to fit into any classification. Dermatomyositis, in which muscle wasting is accompanied by skin lesions, was described by UNVERRICHT [16] in 1887; but the myopathy may appear without the skin lesion (polymyositis) and the muscle lesion may be more degenerative than inflammatory. Indeed, PARKES WEBER and GRAY [17] suggested that the muscle lesion might more properly be termed a "myososis." Myopathy occurs occasionally in patients with carcinoma, especially carcinoma of the bronchus [18 19]: the mechanism is unknown but the myopathy is certainly not the result of direct pressure or infiltration of the muscle, though it is often accompanied by a neuropathy. Finally, the association of a myopathy with various disorders of the thyroid gland has been recognised for some years.[20 21]

The myopathy described in sheep shows similarities both to the muscular dystrophies and to dermatomyositis. The lesions in sheep, as in humans, tend to be symmetrical, and the distribution is so variable that most of the human types are simulated, including what may be termed a distal type (of GOWERS [6]) and an ophthalmoplegic type (of KILOH and NEVIN [22]). A major difference between the disease in sheep and man is that most of the myopathies in sheep first show themselves in middle age, but a few resembling the juvenile forms commonly seen in man have been recognised. Two other differences are the variety of histological lesions which Mr. PARRY and his colleagues have found in the same animal and the varying distribution of the more severely affected muscles. A possible reason for these findings, however, is that the investigators were able to examine many muscles from each animal, whereas in human pathology the material available for examination is often confined to a single small biopsy specimen. The great variation in the histological appearances in sheep, even within a single muscle, suggests that human biopsy specimens should be interpreted with caution and may not always be a satisfactory basis for diagnosis.

Little is known of the pathogenesis of the muscle degeneration in the myopathies. Unusual amounts of creatine appear in the urine, but this also happens in many diseases with wasting of skeletal muscle, such as Coxsackie-virus infections in man [23] and wasting secondary to nervous disease.[24] Attempts to demonstrate a disorder of carbohydrate metabolism or of the endocrine system have not been successful,[25] and no consistent abnormality of the blood has been found. Any observation which might throw light on this fundamental problem would be invaluable. Though nothing is known about the ætiology of dermatomyositis, many forms of human muscular dystrophy are almost certainly hereditary in origin, male sex-linked recessive, autosomal dominant, and intermediate types being recognised.[11 26 27] One of the more baffling aspects of these myopathies is the variability of the site and extent of the muscle involvement in different individuals and in different generations of the same family. Various genetic explanations have been proposed, based on variations in the penetrance of the genes or the modification in phenotype expression of the genes by the genotype constitution of the individual; but these changes are difficult to measure quantitatively. If the sheep myopathy should prove to be hereditary its study might provide invaluable evidence on this matter; and Mr. PARRY'S Sheep Health Scheme seems admirably adapted to produce such information. Investigators should be able to breed animals in which myopathy will develop, and they could be closely studied, both before and after clinical signs had appeared. More-

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over, they should also be able to breed myopathy-free strains which would be of great economic importance.

The veterinary and agricultural interest of this myopathy in sheep is considerable. The condition called scrapie has been known for nearly two hundred years in Western Europe and for a hundred and fifty in Britain, where from time to time it has become so serious in certain districts that the traditional pattern of sheep-raising has had to be drastically modified. There are no statistics on which to base a detailed estimate of the annual loss, but it may be of the order of £100,000 in Britain, since losses from scrapie often equal the total from all other diseases combined and thus double the annual mortality-rate, which in scrapie-free lowland flocks is normally about 5% of the breeding females. Recently scrapie has been diagnosed in sheep exported from Britain three or four years previously, and this has led to the imposition of a complete embargo by several countries on the importation of sheep from Britain. (The export trade in sheep has been valued at about £100,000 a year.) Yet in many ways the disease has occasioned little comment, largely because flockmasters and shepherds were, and are, extremely reluctant to talk about it; they knew there was no cure and they preferred to salvage what they could and say nothing. An encouraging aspect of the new work has been the way in which the confidence of flockmasters and their shepherds has been gained, thus permitting a new approach and a more intimate liaison between the agriculturist and the veterinary surgeon than is usual in ordinary veterinary practice.

In spite of much research no acceptable pathological basis for the clinical signs of the disease has previously been described. Investigation in Britain and France for the past twenty years has mainly been concerned with confirming that it was an infectious disease, and the view commonly held at present [28] is that scrapie is due to a virus with an incubation period as long as five years. This hypothesis is based on the fact, first reported by CUILLÉ and CHELLE in France,[29] and subsequently confirmed by GORDON [30] and WILSON et al.[31] in Scotland, that if sheep were inoculated intracerebrally with an emulsion prepared from the brains of scrapie sheep, a proportion of them developed signs of the disease. This was interpreted as meaning that the inoculum contained an infectious agent—a view which gained support when an increased incidence of scrapie was noted in certain flocks which had been given a "louping-ill" vaccine prepared inadvertently from the brains, amongst others, of scrapie sheep.[30] Clearly the data hitherto thought to establish that scrapie is an infectious disease will need reappraisal. It would be especially helpful to know whether the experimental disease is identical with the one occurring naturally and whether the source of the experimental sheep in Britain and France was such that they were free from the myopathy trait. Official acceptance of the virus hypothesis has led to the elaborate and onerous veterinary police measures adopted in some countries when the disease was recognised officially for the first time. As the foundation animals from which the sheep stocks of these countries have been bred were imported from Western Europe during the period when scrapie is known to have been widespread, it seems probable that the scrapie and myopathy trait was imported with some of these sheep and that some form of the disease has existed in these countries for many years, though, for a variety of reasons it may have occasioned no comment. These veterinary police measures will need review now that it appears that the sheep myopathies are probably hereditary. The recognition that these myopathies are more widespread than the clinical disease of scrapie brings a need for much more information about the relation between the various types and the possible rôle of environmental factors in their development. Though these questions will demand many years of study, their elucidation will not only be important to agriculture but should also lead to a better understanding of the human myopathies. At last we have a suitable experimental animal.

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Treatment of Myxœdema Coma

MYXŒDEMA is the outstanding example of a disease which can be successfully treated by replacement therapy: yet people still die from it. This is evident from the far from negligible number of deaths from myxœdema which have been reported in recent years. These cases have all ended in coma; and once a patient with myxœdema goes into coma recovery is unusual. The characteristic feature of myxœdema coma is the extreme hypothermia, but this was not recognised until a few years ago—for the simple reason that clinical thermometers do not record below 95°F. When the rectal or vaginal temperature is taken with a suitable thermometer patients in myxœdema coma are almost always found to have a body-temperature of less than 90°F. This observation at once suggests a hopeful line of treatment—rewarming the patient. In the case described on p. 754 by Dr. MARSHALL and Dr. MCCAUGHEY, this simple measure seemed to restore consciousness by itself. The patient described by Dr. DYSON and Dr. WOOD on p. 757 was also rewarmed, though apparently without benefit. Rewarming can be achieved by a warm bath or an electric blanket, but it must be gradual, otherwise cutaneous vasodilatation will defeat the object of the manœuvre. In line with modern ideas on the pathology of myxœdema, both patients were also treated with potent adrenal cortical hormones. There is some reason to believe that a myxœdematous patient's adrenals function poorly, and this form of treatment is therefore logical. But in neither of the cases was there any definite sign that it made a useful contribution.

The most remarkable thing about the two cases we publish this week is the striking difference in the treatment with thyroid hormone. Dr. MARSHALL and Dr. MCCAUGHEY gave no form of thyroid hormone at all, whereas Dr. DYSON and Dr. WOOD gave a total of more than 2 mg. of triiodothyronine. This substance is the most potent form of thyroid hormone available, and 1 mg. is more than ten times the normal daily requirement, being equivalent to something like gr. 50 of dried thyroid. It is true that ASPER et al.[1]

1. Asper, S. P., Selenkow, H. A., Plamondon, C. A. *Bull. Johns Hopk. Hosp.* 1953, **93**, 161.

have given single doses of 1 mg. in myxœdema, but it is clear from their data that the patients received a severe metabolic jolt; and most people would consider 1 mg. too high a dose. It can be argued that since myxœdema is due to lack of thyroid hormone the best form of treatment is to replace the deficiency as rapidly and as completely as possible. Previously it had been held that the heart of a myxœdematous patient is abnormally susceptible to thyroid hormone, both as a result of long deprivation and because of the high incidence of coronary-artery disease in these subjects; therefore treatment must be started in the gentlest possible way with minute doses. Dr. MARSHALL and Dr. MCCAUGHEY were no doubt thinking along these lines and would have started thyroid therapy after their patient had been sufficiently improved by other means. Nevertheless not everyone would be prepared to wait as long as seven days.

These two cases illustrate widely different views on the use of thyroid hormones in myxœdema coma. One school of thought regards huge doses of the most potent hormone as potentially life-saving; the other considers that even modest doses may be lethal. It is perhaps surprising that no attempt has been made to resolve this issue—presumably because myxœdema coma is fortunately rare. In the absence of satisfactory evidence most physicians will probably steer a middle course, by giving smaller doses of triiodothyronine—about 0·1 mg. daily. The best solution of all would be to prevent the onset of myxœdema coma. This can be achieved only when doctors are continually on the alert for myxœdema and treat it before the extreme stage is reached. Moreover, it must be made plain to patients that treatment, once started, must continue without interruption for the rest of their lives.

Annotations

THE FUTURE OF DENTISTRY

IT is more than doubtful whether the recommendations made by the Interdepartmental Committee on Recruitment to the Dental Profession [1] will have the desired effect of offsetting the grave shortage of dentists in this country—a shortage that becomes more and more acute as the older members of the profession reach retiring age. As about half those on the Dentists Register are 55 years of age or older and will therefore retire within the next ten years, it will be necessary nearly to double the intake of students in dental schools (from about 500 to 1000 annually) in order merely to maintain the profession at its present quite inadequate strength. To increase its size to 20,000 practising dentists, which the Teviot Committee thought the minimum needed to provide a reasonable dental service, the intake of students would have to be at least trebled.

The committee believes there are in the country enough potential dental students of the right calibre to double the actual intake, if only they can be persuaded to consider dentistry a desirable and satisfying career. The report suggests efforts to attract many more women, for whom the members of the committee regard dentistry as a very suitable profession which can be followed even after marriage. But it is worth noting, perhaps, that most married women dentists practise only part-time; and, if we are to rely largely on women rather than men to fill the gaps in the ranks of the profession, we shall have to recruit many more students each year—not the most economical use to make of the none too abundant teaching facilities.

From the report's discussion of the reasons why the career of dentistry seems so unattractive to school leavers, it is evident that none of these can be remedied easily. The status of the profession in the community is unjustifiably low—a sad reflection on the ignorance of the public on matters of dental health. Clearly the standing of dentistry and the public esteem for the dental practitioner will be improved only gradually and indirectly, as people come to understand the important function the profession performs. Meanwhile no doubt many young men choosing their career will be put off by the limited nature of the dentist's work, for which neither the financial reward nor the prestige of the profession offers sufficient compensation. They are unlikely to be encouraged to think otherwise by dentists themselves, most of whom seem profoundly dissatisfied with the operation of the National Health Service, with the limitation of professional freedom implicit in the need to obtain prior consent from the Dental Estimates Board before certain types of treatment can be undertaken, and with the method of payment—by fees for items of treatment. So long as the dentists themselves feel that the system under which they work is at fault, they are unlikely to advise parents to enter their children for the profession. The committee recommends that some alternative system of remuneration should be devised, whereby the older practitioner could be rewarded for his greater professional experience and not penalised for his inability to compete with the younger dentists in physical "output." The general practice of dentistry is unique among the professions in that income declines seriously as the practitioner advances in years; but the only simple means of overcoming this would be a salaried dental service, which most dentists would certainly reject.

If there is little immediate prospect of improving the status of the profession, or otherwise making it so attractive as to double the number of candidates for entrance to the dental schools, are there no other means of filling the gap? The 1956 Dentists Act allows for an experiment in the training and employment of dental ancillaries, to relieve the dentist of some of the simpler dental operations. Should the experiment succeed to the satisfaction of the Privy Council, no doubt in the future ancillary dental workers will bring some relief to certain sectors of the dental services (notably the maternity and child-welfare and school dental services provided by the local authorities); but one cannot suppose that they will be numerous enough to compensate for the certain shrinkage in the size of the dental profession, at least for a long time to come. Only if we envisage the members of this much-reduced body of dentists each acting as leader and supervisor of a team of ancillaries—reserving to himself the more complex operations of oral and dental surgery while passing on to his assistants the simpler tasks—can we expect the institution of ancillaries to do much towards solving the problem. As this would involve, apart from questions of recruitment, a recasting of the curriculum for dental students and a transformation of day-to-day practice, it is obviously a change that cannot be brought about quickly or without great opposition. Possibly we shall be driven by force of circumstance to accept the necessity for such an upheaval, just as the profession has gradually been forced to the authorisation of ancillaries. Meanwhile, the outlook for the dental health of the nation remains grim, and it cannot be said that the measures proposed in this report offer much prospect of relief.

1. Report of the Committee on Recruitment to the Dental Profession (chairman: Lord McNair). Cmd. 9861. H.M. Stationery Office. 1956. Pp. 61. 3s.

SURVIVAL AT SEA

DESPITE the long history of the dangers of seafaring, still one of the most hazardous occupations,[1] it is only in recent years that the saving of life after shipwreck has been seen as a matter of medical concern. Advances in this field sprang, like so many others, from war. In 1943, Critchley [2] published the first medical study of survival, including an account of the psychological aspects which has never been bettered. A Medical Research Council memorandum,[3] issued in the same year, based practical advice to castaways on existing physiological knowledge. By the end of the war it was clear that not only had casualties at sea been heavy, but most of those who died had succeeded in escaping from the sinking ship, and many of them had reached some kind of support in the water. Cold was undoubtedly responsible for much of this loss of life. The human body steadily loses heat when immersed in water at the temperatures of most seas outside the tropics, and can survive for only a very limited time. Immersion of parts of the body, as happens on Carley floats, causes local cold injuries which may be very disabling, and must make death from exposure more likely. Even without immersion, castaways in any open craft may be exposed to weather in which death from cold is probable. Much relevant work on the effects of cold has recently been summarised by Burton and Edholm.[4] Although the chances of a man surviving become vastly better once he has reached a life-craft of any sort, it seems an unavoidable conclusion that to offer a high probability of survival in all climates the craft must keep its occupants completely out of the water and shelter them from the weather.

To meet this need, the Naval life-raft was developed between 1945 and 1950. This is an inflatable boat, resembling the R.A.F. dinghies which became familiar during the war, but large enough to seat 20 men in comfort, and provided with a double-walled tent with sleeve entrances. These rafts gave excellent results when tested in the Arctic, where a small team of Naval volunteers lived in one for five days. Tropical waters are less perilous, and some very long voyages have been made with rudimentary equipment; but there is the constant danger of death from thirst, and where the sun's rays are intense unprotected men may die in a few days.[5] The rafts were found to give completely effective shelter. Detailed studies have also been made of water requirements and possible sources of water, and of food rations, seasickness, and other related problems.[6 7]

The physiological research is now reaching its practical fulfilment. Naval vessels are gradually being equipped with the new rafts in place of Carley floats. Merchant ships are permitted to carry the rafts as additional equipment, and since 1954 rafts have been approved to replace compulsory "buoyant equipment" on ships other than those making international voyages (which are governed by an international convention which last met in 1948). Now, since Oct. 1, fishing vessels in certain classes must carry sufficient of the new rafts to accommodate all persons on board.[8] These vessels include trawlers, which have suffered particularly heavy casualties in recent years; and lives from these ships have already been saved by inflatable rafts. An objection to rafts for passenger ships is that they are boarded from the sea, whereas boats are intended to be boarded at deck level and then lowered. In the event, however, listing of the ship, heavy seas, and bad weather may prevent the launching of boats. When the *Titanic* and the *Empire Windrush* were lost all the boats carried were successfully launched; on the other hand, when the *Princess Victoria* sank, no boats could be launched by the designed methods, and when the *Andrea Doria* sank, less than half the boats could be launched. To launch the raft, already secured by a painter (which incidentally operates the inflation mechanism), all that is needed is to push it over the ship's side. In bad weather a raft is unlikely to injure people who jump or are trapped between the raft and the ship's side, and it is not liable to be swamped or to capsize. There are various ways in which the boarding difficulty may be overcome. Rafts might be manned at deck level and lowered in turn on a platform, whenever the situation allowed the use of davits.[9] The simplest, if not quite the cheapest, solution would be to carry rafts as well as boats, perhaps with the rafts stowed in the boats.

Research must continue, for recent events have raised doubts about the efficacy of present methods. If the remaining problems can be overcome, we shall have seen a conspicuous example of successfully applied physiology.

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3. Medical Research Council war memorandum no. 8. H.M. Stationery Office, 1943.
4. Burton, A. C., Edholm, O. G. Man in a Cold Environment. London, 1955; see *Lancet*, 1955, ii, 72.
5. Adolph, E. F., et al. Physiology of Man in the Desert. New York, 1947.
6. Hervey, G. R., McCance, R. A. *Proc. nutr. Soc.* 1954, **13**, 41.
7. Hervey, G. R. *Science News*, 1955, **38**, 72.
8. Merchant Shipping (Life-Saving Appliances) (Amendment) Rules, 1956. S.I. 1956 no. 645. H.M. Stationery Office.

ENDOBRONCHIAL TUBERCULOSIS IN CHILDREN

AT a symposium [10] last year, at Denver, Colorado, on tuberculosis in childhood some of the discussion centred round the fact that in adults tuberculosis of the major bronchi can be successfully treated by chemotherapy whereas the response in children is less satisfactory. The ætiology is not the same: in adults endobronchial lesions are due to contiguous spread from a cavity or bronchial abscess deeper in the lung; in children the endobronchial lesions are the result of pressure on or rupture into the bronchus of enlarged caseous hilar lymph-nodes. And although extensive miliary lesions and even tuberculous meningitis may resolve, lesions in the lymph-nodes resist even the longest chemotherapeutic attack.

Pressure on the relatively small bronchus of the infant and young child gives rise to collapse ("epituberculosis") if there is total occlusion of the lumen or to obstructive emphysema if the block is partial or intermittent. Both conditions are often slow to resolve, the course of events being dictated by the behaviour of the lesion in the hilar lymph-nodes. If the glands diminish, the bronchus becomes patent again and the affected part of the lung reverts to normal or near normal; if the glands enlarge, obstruction persists or erosion into a bronchus may follow. Rupture is usually silent with scarcely a febrile episode, and it is sometimes followed by extrusion of the caseous material and complete healing. As the perforation is localised, ring stenosis does not ensue. Occasionally acute respiratory distress is caused by a large extruded caseous focus. Bronchoscopy is then urgent, but caseous matter and granulations may also be removed with benefit in less pressing circumstances.

Laff and others [1] recommended that all children with a positive tuberculin reaction and a wheezing, ringing, or brassy cough, dyspnœa, or unexplained febrile episodes should be bronchoscoped. Radiological evidence of segmental, lobar, or whole-lung atelectasis, in their opinion, makes bronchoscopy imperative, and so does the presence of the "middle-lobe syndrome" and obstructive emphysema: the removal of granulations in obstructive emphysema may be followed by prompt relief of the obstructive symptoms. Though there has naturally been some reluctance to bronchoscope children, British experience nevertheless confirms the view that it is

9. Wallace, W. *Shipbuilding and the Shipping Record*, 1953, **82**, 492.
10. Proceedings of Symposium on Tuberculosis in Infancy and Childhood. National Jewish Hospital Denver, Nov. 9–12, 1955. *Amer. Rev. Tuberc.* **74**, suppl.

useful in such cases; and treatment has in some respects been carried further by thoracotomy to remove grossly enlarged and caseous lymph-nodes [11]—an operation which has also been successfully undertaken in adolescents with similar lesions.[12] Indeed, the main interest of the Denver symposium centres on certain pathological features of the condition. Canetti pointed out that the caseous lymph-nodes generally contained few bacilli, that sudden spread of disease after rupture was therefore uncommon, and that the extrusion of the caseous material was largely a mechanical problem. The disappointing response of hilar and paratracheal lesions to chemotherapy could be similarly explained, since large caseous foci containing few bacilli are not readily amenable to drugs. Surgical removal of caseous nodes which are the cause of pressure phenomena and which cannot be dealt with through the bronchoscope seems attractive therefore both for its immediate benefits and as a means of avoiding later recrudescence.

QUALITIES FOR MENTAL NURSING

HUMAN ability for mechanical tasks can be predicted comparatively easily by analysing the skills required, and one can then devise methods of training in these skills. But the accuracy of prediction falls sharply where people cease to act as machines and where efficiency depends as much on indefinable qualities of character as on intelligence.

The first report of the World Health Organisation's Expert Committee on Psychiatric Nursing [13] is a searching analysis of the work of a nurse in a mental-health service, of the skills and qualities required, and of the training needed to perfect them. Its basic assumption—perfectly correct but not widely enough recognised—is that nobody can achieve an entirely passive or neutral relationship with a sick person: every contact provokes a reaction of some sort. The nurse has more to do with the patient than anyone else except his fellow patients, and it is therefore very desirable that her contacts should be helpful. The report goes on to analyse the patient's needs and to plan a system of training to enable the nurse to meet them. There may be psychiatrists who will object to the proposal that so much detailed therapy should be delegated to the nurse, but since she cannot avoid affecting her patient it is as well that she should know what she is about.

The authors assume that nursing recruits are both plentiful and of considerably higher intellectual and educational level than is at present the case in this country: the model presented is clearly intended as an ideal. Yet somehow this highly sophisticated and intellectual Galatea fails to come to life as a nurse. Many experienced doctors and patients prefer their nurses to be kindly and understanding rather than intelligent and erudite. For success as a nurse, pity is almost certainly the crucial quality (lacking it she is like a watch without a mainspring); but it is delicate and easily damaged. There is a danger that the analytical attitude towards herself and her patients advocated in this report may lead to the inhibition of compassion by self-consciousness. Certainly she must learn to order her emotions, if only in self-preservation; but she should not forget that Florence Nightingale is honoured not only as a brilliant organiser but as a person full of compassion. In Great Britain at least, much good would be done if nurses of all types could be released from the bondage of a tradition that still too often frowns upon the outward manifestation of their natural feelings of kindliness to patients. A chat at the bedside over a cup of tea, by relieving tension, will often do far more good than a drug.

11. Thomas, D. *Proc. R. Soc. Med.* 1952, **45**, 743.
12. Harvey-Samuel, R. E. D. *Tubercle*, 1956, **37**, 255.
13. W.H.O. Technical Report Series, no. 105, 1956. Pp. 43. Obtainable from H.M. Stationery Office. 1*s.* 9*d.*

FAMILIAL HYPERCHOLESTEROLÆMIA

ALTHOUGH essential familial hypercholesterolæmia is fairly well known, full agreement has not been reached about how it is inherited. Wilkinson et al.[1] considered that the condition was transmitted as a dominant characteristic; and they suggested that the homozygous state was indicated by the presence of cutaneous and tendonous xanthomas in association with hypercholesterolæmia, while in the heterozygous state there was hypercholesterolæmia alone. This view was supported by Adlersberg et al.[2]

Between 1941 and 1943 Kornerup [3] investigated a series of hypercholesterolæmic Danish families, and recently Piper and Orrild [4] have reported the results of a follow-up of 12 of these families. Of 53 patients originally examined by Kornerup, 17 had died, 10 of them apparently from coronary occlusion. The average age at death of these 10 patients was forty-seven years. 35 of the surviving patients were re-examined, and 78 new cases were discovered. These findings strongly support the view that the condition is a dominant inherited characteristic. The incidence of hypercholesterolæmia was 48% in 65 children of marriages in which one parent had hypercholesterolæmia; this corresponds well with the expected inheritance of a dominant characteristic. There were several examples of hypercholesterolæmic xanthomatosis in the offspring of hypercholesterolæmic persons and their normal spouses; and normocholesterolæmia was also found in the children of parents with xanthomatosis. These findings argue against Wilkinson's hypothesis that xanthomatosis indicates homozygy.

When Kornerup first examined his patients, 17 of them had manifest xanthomas of skin or tendons. Thirteen years later, 8 more of them had xanthomatosis; the xanthomas could appear at any age, but seldom before the age of twenty. The distribution of serum-cholesterol levels in different age-groups showed that the average level rose until about the age of fifty-five years, and then fell, showing the same type of change with age as the curve for the general population. This suggests that the same factors may be responsible for changes of serum-cholesterol with age in normal and hypercholesterolæmic populations. Hypertension was apparently no commoner in hypercholesterolæmic people than in the general population. On the other hand, there is no doubt that the incidence of coronary-artery disease is abnormally high. Whether this is a secondary effect due solely to hypercholesterolæmia or whether other factors are concerned, is not certain; but the clear-cut pattern of inheritance in this condition brings up the possibility that lesser hereditary variations of this kind may be more generally concerned in the genesis of arterial disease.

TEACHING AT THE COLLEGE OF SURGEONS

WITH its research departments, museums, library, and residence, the Royal College of Surgeons has made itself into a great centre of postgraduate surgical teaching for doctors from all over the world. Particulars of the instruction, help, and amenities offered have now been set out in an attractive and modest booklet, copies of which may be had from Mr. W. F. Davis, the deputy secretary of the college, Lincoln's Inn Fields, London, W.C.2.

Prof. G. PAYLING WRIGHT and Dr. DENIS HILL have been appointed members of the Medical Research Council.

1. Wilkinson, C. F., Hand, E. A., Fliegelman, M. T. *Ann. intern. Med.* 1948, **29**, 671.
2. Adlersberg, D., Parets, A. D., Bons, E. P. *J. Amer. med. Ass.* 1949, **141**, 246.
3. Kornerup, V. Familiaer Hypercholesterolaemi og Xanthomatose. Kolding, Denmark, 1948.
4. Piper, J., Orrild, L. *Amer. J. Med.* 1956, **21**, 34.

Special Articles

THE BIOLOGY OF AGEING*

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IF we had throughout life the same resistance to stress and disease as we had at the age of 10, about half of us might expect to be alive in 700 years' time. But in man, and in a number of other animals, resistance to disease and disturbance becomes progressively less with increasing age, and the old are killed by causes which would not have killed them when they were young. This process is senescence, or ageing. The object of studying it is to find out why it occurs, and whether and how it can be controlled.

An Index of Senescence

To some extent the study of ageing is the study of development in general, since many organisms, including ourselves, develop towards an infirm old age if they live long enough. But, though we can, if we wish, describe the progress of a child from infancy to adolescence as ageing, this is certainly not senescence. The point about senescence which distinguishes it from other processes of development is that it is a deteriorative process: when we speak of senescence we mean the sum of those processes in development which lead to a failure of our ability to meet stresses, injuries, or changes. This may show itself in various ways—reduction in endurance, in muscular power, in fertility, or in speed of learning—but it is seen first and foremost as an increasing liability to die with the passage of time; and it is the measurement of this liability at different ages which is the most practically useful and the most consistent index of ageing. The probability that an individual who has survived until time t will die before time $t + 1$ is called the rate of mortality. In an animal which did not undergo senescence, this probability, all other things being equal, would remain roughly constant throughout life; but in animals which do undergo senescence, including man, it increases steadily with increasing age. The risk of death is greater between our 70th and 71st birthdays than between our 16th and 17th, by a factor of about 30. In studying senescence, we are studying the reasons why this should be so.

If you have a population of objects, living or inanimate, whose resistance to injury is constant and unrelated to their age, and which are exposed to the same amount of injury at all ages, then the population will decline in a smooth logarithmic curve, and a fixed proportion—5%, 20%—will die or be destroyed in each unit time (fig. 1*a*). In a population like this, no animal is immortal, but no animal knows how long he will live, or how near his end may be. If his expectation of life at birth is one year, then at the age of 1 year or 20 years it is still one year. Such a population does not senesce. An individual has no fixed life-span, and we measure probable survival as the half-life, which is the time taken to reduce the population by half.

If, on the other hand, you have a population of objects or animals which become increasingly liable to die or be broken with increasing age, and they are exposed to the same hazards at all ages, then few will die at first; the proportion dying will increase with age, and the expectation of life will decrease. Unless the early death-rate is high, there will be a modal (or most popular) age for dying, and the probability of any individual much exceeding this will be very small. In other words, the animals or objects will have a predictable life-span (fig. 1*b*).

The first type of behaviour—the steady decline—is characteristic of radium atoms decomposing; of robins in the wild state; or of plain glass tumblers in a restaurant being broken. The second is characteristic of human beings; of robins in captivity; probably of all birds and mammals under protected conditions; and of toughened glass tumblers, which break more easily when they are scratched, and consequently senesce. The toughened glass tumblers decline along a straight line (fig. 2), but it is an arithmetic not a logarithmic one.

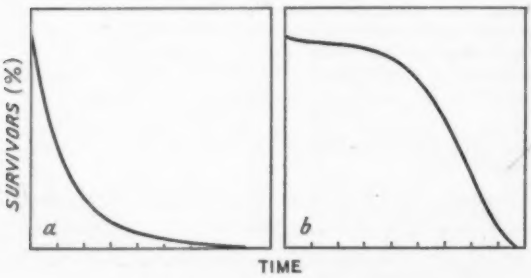


Fig. 1.

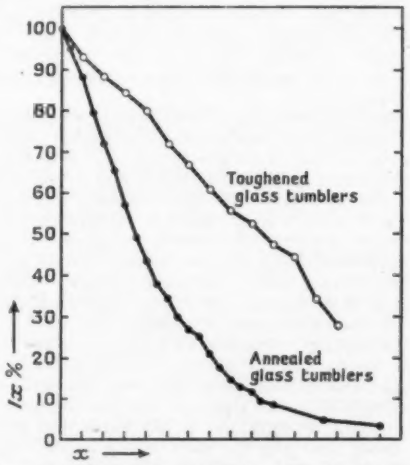


Fig. 2—Survival of restaurant tumblers (based on data of Brown and Flood 1947).

It was customary at one time to talk about the potential immortality of organisms which did not undergo senescence. This quite meaningless phrase has long outlived any usefulness it ever had. Whether in a senescent or a non-senescent population, the chances of immortality for an individual are infinitely small. Organisms which do not age are no more potentially immortal than their investigators: the only advantage they enjoy is that the odds on their death within a fixed period are fixed regardless of age, instead of shortening with the passage of time.

Comparing Survival Curves

To find out whether an organism does or does not senesce, we have to keep a large number of specimens under favourable conditions until the last has died, record their ages at death, and draw a curve of survival. Alternatively, but rather less reliably, we can observe a large mixed population of young and old animals for a suitable time, and determine the mortalities of each age-group. In drawing survival curves for man, we do the second; and we have to remember that in this case there has

* Abridged from a Friday Evening Discourse given at the Royal Institution, London, on June 1, 1956.

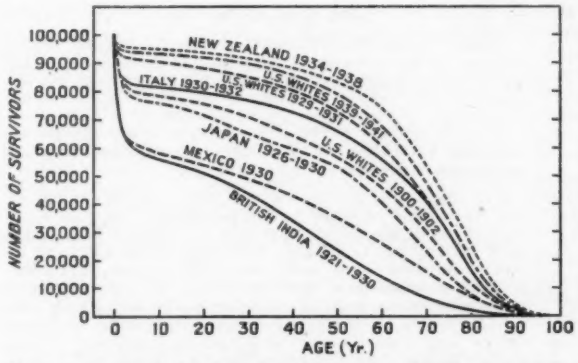


Fig. 3—Survivors of 100,000 male births (from life-tables for selected countries, after Greville 1946).

been a very large change in mortality-rates during the life-time of the oldest members of our sample, so that those who are 80 years old in 1956 are the survivors of a group which underwent the infant-mortality rates current in 1876, and the child-mortality rates current in 1886.

After a period of special risk in infancy, man under good conditions has a long period of adult vigour with a gradually increasing mortality, a modal age of death between 70 and 80 years, and a limit of rather over 100 years. Fig. 3 also shows the effect of improved environmental conditions on the curve of survival. This is important, because in very few laboratory animals is it possible to maintain conditions which yield as low an early mortality as in privileged man. The curves which one obtains are commonly intermediate, therefore, in form between the random, logarithmic curve, and the square-shaped curve which you see here. In fact, one of the most striking features which we have found in collecting survival curves of animals of all kinds is the frequency with which a given group declines in numbers on an *arithmetic* straight line: that is to say, a constant number tend to die in each unit time, but as the total number is decreasing the mortality is obviously rising—so these animals are like the companions of Odysseus of whom the Cyclops Polyphemus ate the same number each day. This resembles the behaviour of the hard glass tumblers. What the significance of this pattern of ageing may be, it is not easy to say, but we find it in many quite different kinds of animals under not very good conditions. It is interesting because it means that in these populations the distribution of life-spans is rectangular—in other words there is no commonest age of death—and distributions of this kind are rather unusual in biology. The curve for man in poor conditions (fig. 3) approached this shape, and possibly under better conditions the survival curve of these other animals would come to resemble more closely that of man in the privileged countries.

A senile increase in force of mortality can, of course, be detected only in an environment where enough of the population under study actually reach old age, and in *wild* populations this condition is only rarely fulfilled. Some social animals, from sheep to bees, live commonly to old age; but in many birds and small mammals the force of mortality is constant throughout life: it may even decline, because older animals are less vulnerable and more experienced. Many small birds are able to live for fifteen or twenty years in captivity, and then die of "old age"; but in the wild the proportion surviving for five years is negligible.

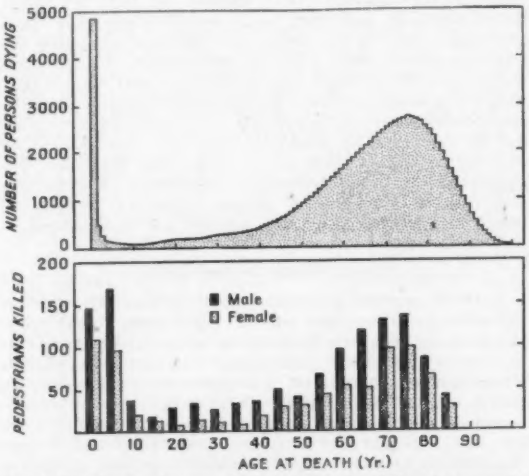


Fig. 4—Distribution by age of all deaths in a privileged community (above) and of deaths of pedestrians in road accidents.

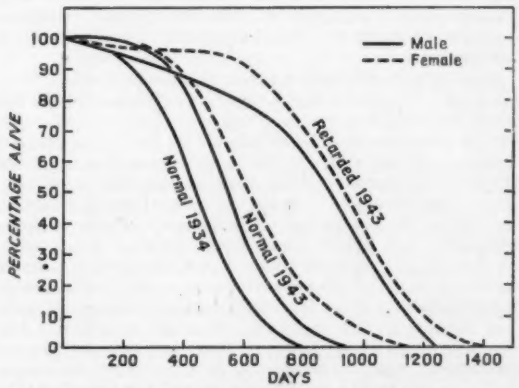


Fig. 5—Survival of normal and of retarded male and female rats, showing effect of dietary restriction (from McCay et al. 1943).

Evidence of Senescence

In work on ageing we use survival curves largely to determine which animals display senescence, and how the increase in their mortality with age compares in pattern with that of other forms. One can measure other characters, such as rate of repair; but an increasing death-rate is the most widely applicable measure of ageing, and it fits well with other indices of vigour in general. In fig. 4 I have put together the age-distribution of deaths from all causes in man, and the age-distribution of deaths of pedestrians in road accidents, which is perhaps a measure of several kinds of vigour—attention, ability to see and avoid danger, and ability to recover from an injury received. There is, as you see, good agreement between them.

For the purposes of medicine and biology, it is also desirable to infer the degree of senescence, not in a large population, but in a single individual. Obviously this estimate cannot be made upon such an individual by determining the probability of death, or even (without killing the specimen or patient) the liability to die from a given injury. In man, or in domestic animals like the dog or the fruit-fly, an experienced observer can, with variable accuracy, assess by inspection the degree of "senescence." But we have no reliable means of measuring the changes in individual vitality in a life-long study of single individuals, and consistent measure-

ment of individual senescence is not really feasible at present. Subsidiary measurements, such as the decline in reproductive power, or the loss of the capacity for growth, cannot yet be related to the statistical picture of age obtained from life tables. There is no characteristic pathological change in the senile human body: rather, the characteristic pathological change is an increase in the number of pathological changes.

The use of vital statistics as our chief source of information about age processes means that we are no longer thinking in terms of a single all-explaining process which "causes" or "explains" the ageing of animals. The statistical test embraces all forces, in all types of animal, which lead to an increased mortality with increasing age. It may be that there is a single "general" process which accounts for many of the phenomena of senescence in many groups, but it must be evident that the cause of death from old age in the imago of a silk-moth (which has no mouth and does not feed), in an elephant (whose life in the wild is limited by the wearing out of irreplaceable teeth), and in man (whose resistance undergoes a far more generalised and subtle impairment) is likely to be widely different, although the form of their life curves may be similar. The search for unitary causes of ageing quite possibly reflects a misconception. If there is a common factor of ageing in man, moth, and elephant, it is more probably an evolutionary one. I shall deal with this later.

Ageing is not a self-evident process like wear in a machine. Because a cart wears out in proportion to the use it receives, a horse does not necessarily do likewise. An old horse becomes unserviceable for two quite distinct reasons: it has suffered the injuries and diseases of a lifetime, and some of these, such as the loss of an eye, cannot be restored; but at the same time it has also lost some of the power of self-repair which it once possessed, but which was never present in a cart. Obviously, any animal which has parts that it cannot replace is liable to progressive deterioration, and after it passes a certain point this deterioration through damage may become a chain reaction. It is also true that a few animals have their lives limited by straightforward mechanical wear in structures such as teeth or wings. But this weakening by accumulation of injury is likely to proceed at a very variable rate under different conditions, and to explain the behaviour of mammals or birds in terms of a series of injuries going on throughout life we should have to postulate injuries inflicted from within, not from without—because of the very high consistency of maximum life-span within each species. It is relatively easy to shorten the lives of organisms; but in mammals there is a characteristic life-span under optimal conditions. That of man has remained extremely constant since the Biblical estimate of four score years. It is very unlikely that any single, unknown process of wear, inaccessible to changes of environment, determines this very constant behaviour, and we therefore must regard mammalian ageing as developmentally timed—i.e., determined as part of the programme of development which leads to the orderly appearance of the organs in the embryo, or later to the onset of puberty.

The key problem for us is the nature and content of the developmental programme in man which ends in death from old age. Senescence is not simply the result of the passage of time. In an organism which is able to pass long periods in suspended animation, these periods do not count, or count very little, toward its normal, uninterrupted life-span. The clock which determines the progress of age changes can be stopped and re-started, or—more important to us—it can be slowed. We need, then, to find out which components in the programme of living, and especially the mammalian programme of living, are the timekeepers. The life of aircraft is definable in flying hours. We need the comparable unit.

Life-span of the Cell

There is one determinant of fixed life-span which appears to be widespread, and that is the fact that cells which are no longer able to divide have, as a rule, limited lives.

The life-span of tissue cells in their natural situations certainly varies a great deal, but in most cases it is not accurately known.

Red blood-cells in man have a life curve almost exactly like that of a prosperous human population, but with a life-span of about 100 days. Skin cells forming the horny outer layer become functional only after they die as cells, and the rate of turnover varies with factors like friction, and also—in mice at least—with the time of day. Most mammalian nerve-cells can never divide once they are formed, though they can regenerate parts which are lost. Their lives, we know, can be very long—as much as a century and longer in man, though similar cells in a mouse need survive only for three, or at most four years.

It seems probable that there are cells which can renew their ferment systems only by division; that spoilage occurs in these systems with use; and that any cell which—in the interest of special function, or of maintaining body proportion—renounces its right to divide has set a limit to its operational life.

One of the things we are trying to discover is whether senescence, of the kind found in mammals, occurs in all vertebrates. In particular, we need to know whether there is any difference in this respect between vertebrates like birds and mammals, most of which cease to grow in adult life, and fish, reptiles, and amphibia, many of which continue to grow throughout life, or are able to stop and re-start their growth with very little reference to maturity and differentiation. An animal which could replace all its cells, and replace them with cells just as good, would presumably not age. To do this it would not need to increase in size; but it so happens that the power of replacement is often highest in animals which do in fact continue to grow. In those which do not, and which age, we need to know whether their ageing is a result of failing to replace cells, or of replacing them with *inferior* cells, or of some other cause.

The late G. P. Bidder, studying the plaice, found that in these fish size was always a simple function of age, and that up to 20 years of age both size and number of eggs continued to increase. This was true even in very large and very old specimens, and this is the general pattern in a great many large and medium-sized cold-blooded vertebrates: they appear to have no fixed maximum size, and they show no evidence of a fixed maximum age. They seem to be able to maintain the replacement of cells, and the production of new cells, throughout life, though they grow more and more slowly with the passage of time. Now Bidder suggested that the sharp senescence of mammals and birds at a characteristic age was a by-product of having a fixed adult size, evolved to enable them to move actively on land. He suggested that the endogenous senescence of mammals was due to an evolved growth-inhibiting mechanism which also, and incidentally, limited cell replacement.

Observations on the Guppy

It might appear a simple matter to find out whether fish or frogs or tortoises senesce. But since this requires the keeping of a large population under good conditions throughout life, direct experiment is in fact very difficult. Frogs can live for twelve to fourteen years, goldfish can live as long as forty, and newts for twenty-five or thirty; tortoises, and probably some of the other larger reptiles, can live a century at least and probably much longer. But there is no easy indirect method of getting an answer to this question, and we have had to attack it directly, by looking at the behaviour of a small aquarium fish,

the guppy, which is known to have a fairly short life—that is to say, in aquaria it rarely lives over two years.

For our purpose the guppy was particularly useful for two reasons. First, the female, which is larger, continues to grow throughout life towards a limiting size, whereas the male ceases to grow early and has a fixed size; yet the life-spans of the sexes are not greatly different. Second, the growth of the sexually mature guppy can be very easily controlled by altering its food intake and its living-space. Individuals will live in ordinary milk-bottles for up to a year without change of water, and under these conditions they remain minute although fully mature; but growth can usually be re-started at any time.

It is already clear that the guppies of both sexes do senesce, on a curve rather similar in time to that of rats, reaching an end at about 1200 days.

Up to 1 year of age they have a low death-rate; thereafter it rises very much as in a small mammal and their senescence is a generalised rise in mortality—i.e., it is similar in distribution to the senescence of mammals and is not a special effect like the death of some other fish which always die after breeding. We have now populations of guppies in which half of each batch of fry has been retarded and the other half allowed to grow; the mortalities are being plotted, and the males, whose growth is very little altered by retardation, are used as controls on the females to enable us to see how far any change in life-span is the result of growth, and how far it is the result of mere change of conditions. We can also study the rate at which small pieces cut from the tail are regenerated at different ages.

These experiments should, with luck, answer a great many questions about the differences between ageing processes in cold and warm-blooded vertebrates, and possibly give us some idea of the time-scale of growth in relation to ageing in fish which might be applicable to the large, long-lived forms. But, unfortunately, we have to wait for the answers while the fish live their 1000 days or more.

Retarding the Rate of Living

Moralists have always claimed that there was a relation between a short life and a merry one. By retarding the growth of animals, or their development, or both, we are modifying what Raymond Pearl called the "rate of living." In its wider context, the idea that in a given species life-span depends inversely on rate of living has led to extremely important discoveries. In particular, it has led to the discovery that in spite of their fixed body-temperature the rate of living in mammals—at least some mammals—can be altered without affecting their activity.

In many if not most invertebrates, the rate of growth, the rate of development, and the life-span can all be altered by raising or lowering the temperature, though all three may be altered to different extents. The slower the rate of development the longer the life-span. Restricting the amount of available food can have very similar effects. Daphnia, the water-flea, is a favourite subject for this kind of experiment, and its life-span is approximately doubled by a 10°C fall in temperature. It can also be very nearly doubled by starving the fleas for 15 out of their normal 17–20 moults, at a level which only just maintains life, and then allowing them to grow quickly to full size. The gain in life-span represents, in this case, a period spent, as it were, in marking time.

Over twenty years ago, McCay in the United States made the staggering observation that in spite of the constancy of body-temperature in mammals, exactly similar results can be obtained by dietary retardation in the rat. This observation is still one of the few important discoveries which have been made about the age process in mammals.

If young rats and mice are underfed they cease to grow, but they can resume growth when feeding is increased. McCay found that if rats were kept on a diet deficient in calories, but sufficient in everything else, their growth and development were arrested, exactly as in the water-fleas. Laboratory rats normally live about three years and are senile at that age. McCay kept his rats for periods up to 1000 days on this restricted diet, and they were still immature and juvenile in appearance. He then restored normal feeding; the rats grew rapidly to adult size, although the longest-retarded group had reached an age at which they should have been senile; and they continued to live up to twice the normal life-span of the strain (fig. 5).

The long survival of retarded rats was largely due to a decrease in liability to the illnesses which normally attack laboratory rats—chiefly, in this strain, lung diseases and tumours. It was, in fact, a true postponement of the senile rise in death-rate. McCay himself wrote:

"In general the retarded rat remains active and appears young whatever its chronological age. It is very alert. It tends to go blind in the second and third year of life" (this is a complaint which commonly affects laboratory rats, one which the retardation does not seem to prevent). "Its pulse rate of 340 is about 100 below the normal."

The retarded rats did not become sexually mature. If rats were underfed after puberty, they gained only slightly in life-span—probably because the underfeeding prevented obesity. The gain in life-span was therefore due to a prolongation of childhood. The postponement of growth could not be kept up indefinitely. After about 1150 days fewer and fewer rats were able to start growing again when fed.

Too Early Maturation?

McCay has interpreted his result as meaning that a prolongation of growth prevents age changes. I am inclined to think that what mattered was the postponement of development. Rats do in fact normally continue to grow for an appreciable part of their life-span, and the ends of their bones do not become united to the shaft as in man.

The human growth pattern is quite different from that of the rat, not only in that growth cannot be resumed in adult life but because there is normally a long delay in sexual maturation and in growth which is something like that which McCay induced by starving his rats, but which is physiological. Fig. 6 shows the growth curve of man contrasted with that of the sheep (the pattern in the rat is somewhat similar to that in the sheep).

McCay's work suggests that the length of childhood may be variable while the length of postpubertal life is relatively fixed. Now it has been claimed that in recent years there has been a striking tendency for the age of human puberty in the privileged countries to advance. In girls, where it is most easily dated, it has come down

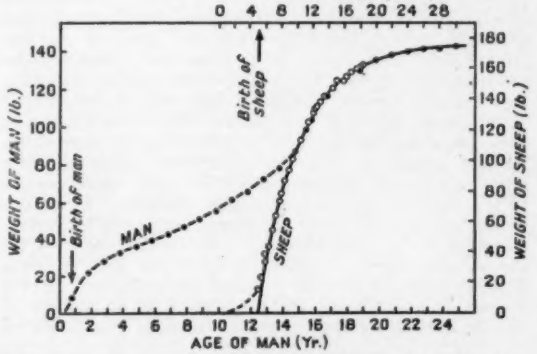

AGE OF SHEEP (mos.)
0 4 8 12 16 20 24 28
WEIGHT OF MAN (lb.)
WEIGHT OF SHEEP (lb.)
Birth of sheep
Birth of man
MAN
SHEEP
0 2 4 6 8 10 12 14 16 18 20 22 24
AGE OF MAN (Yr.)

Fig. 6—Comparison of growth patterns to maturity of man and of sheep (after Brody 1945).

by as much as five years within a century. And in the same way, the heights of Army recruits indicate that, though boys may not be reaching a greater final height than in the past, over the past century they have been reaching their maximum height as much as five years earlier. Puberty in boys has also advanced, as in girls, so that it is said to be much harder now to find soprano choristers of an age to be trained. The reason for this advance is not clear, but almost certainly improved nutrition, or more plentiful nutrition, plays a part.† The question has been asked, by several workers, whether by aiming at maximum growth in children and shortening their childhood, we are not shortening their total life-span—either by that amount, or possibly by more, since the effects of rapid development may persist after puberty.

If the life-span in man is rigidly tied to the time of maturity, this may well be so. But there is one case of a different kind where age at maturity does not appear to fix the age of senescence. In the condition known as congenital precocious puberty, puberty is set in motion without the lag normally found in the human growth and development curve. These children begin to menstruate at 2 or 3; they grow abnormally rapidly but cease growth very early, and therefore are short in final stature. They may be sexually mature by 5 or 6; one little girl of 5 actually bore a child by cæsarean section. Their life-span is normal, and their menstrual periods cease later, not earlier, than those of normal women—following the usual rule that among women early starters are late finishers. The condition is much rarer in boys, but here too it occurs and it does not seem to reduce the final expectation of life. It is worth mention that two processes—mental development and dental development—are not accelerated: the eruption of teeth and the development of adult intelligence and of sexual behaviour follows, as a rule, the normal time-scale. Evidently, therefore, where early development is of genetic origin it does not imply earlier ageing. But acceleration by abundant feeding is not a case of this kind. We do not know the optimal conditions of normal growth for ultimate longevity in man. They evidently need to be investigated, however.

Breeding for Longevity

We know of only one other way in which we can produce a gain in life-span of the same order as that produced by McCay in his rats, and that is by a genetical manœuvre.

Life-span in animals is heritable, and longevity in man tends to run in families—i.e., there is a correlation between the age reached by parents and the expectation of life of their children. This correlation, however, is considerably less than that between parental and child tallness. Where genetic mechanisms are relatively simple, it is often possible to enhance a particular quality by selection and inbreeding. This is to some extent true of longevity in laboratory animals, but it is by no means generally true. Breeding from the progeny of the longest-lived individuals in a group may enhance the life-span up to a point, but it appears to do so by excluding the heritable causes of what I may call "shortevity" rather than selecting the factors which contribute to slow physiological ageing. If inbreeding is carried on for any length of time, the stock often tends to settle down to a stable, relatively short, life-span, which cannot be increased by simple selectionist methods. In such a stock there is usually only one way of increasing longevity, and that is by hybridisation. The results obtained by Clarke and Maynard Smith in fruit-flies (fig. 7) are a striking example of what is called heterosis, or "hybrid vigour." Apart from the inheritance or avoidance of specific heritable causes of death, the main genetic factor

† However, in Roman and medieval times the menarche seems to have fallen between 12 and 13 years of age.

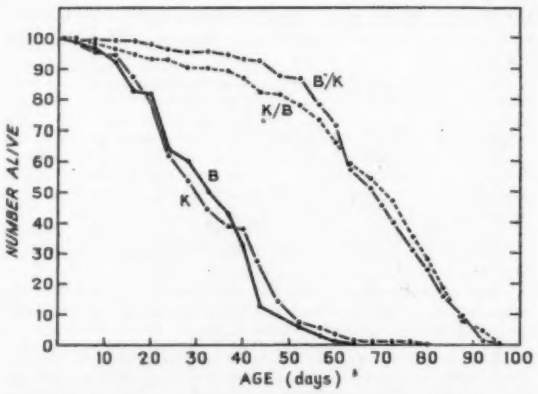


Fig. 7—Drosophila subobscura—hybrid vigour and longevity. Survival curves for inbred lines B and K, and for reciprocal hybrids between them (sexes combined) (from Clarke and Maynard Smith 1955).

in longevity among fruit-flies, and among other animals, is the group of attributes which we call vigour, which expresses itself in rapid growth, high fertility and fecundity, large size, and long life. These characters are often prominent in hybrids, which is why hybrid plants and animals are so largely employed in farming. They appear to result, in many cases at least, from the inheritance of different genetic material from each parent. In many ways hybrids differ from inbreds rather as young animals differ from old: they are more adaptable, less easily disturbed by stresses, less vulnerable, and less variable; and they may owe these properties to having a fuller range, as it were, of chemical possibilities open to them as a result of the diversity of their inheritance. How, if at all, this aspect of vigour is related to ageing we do not know. I should point out, perhaps, that by inducing hybrid vigour we are usually restoring the "wild" life-span of animals which have become short-lived through inbreeding, not adding to the life-span which the species would have when breeding at random or nearly at random.

Age Chimæras

The last problem I shall mention is one which offers some of the nicest experimental possibilities. In an organism such as man, how far is ageing a process which originates in particular cells and how far is it a property of the organism as a whole? For example, when the menopausal ovary stops producing follicles, does it do so because it has run out of germ-cells or has deteriorated in some other way? Or is the menopause timed by a change elsewhere—e.g., in the pituitary gland, which partly controls the ovarian rhythm?

The obvious way to answer questions of this sort is to see what happens to an old ovary if we put it into a young animal, or a young ovary if we put it into an old animal. Such an animal, which would have organs of different ages, is called an age chimæra, and with modern transplantation methods we can create chimæras of this kind; though the question about the menopause cannot be answered by experiments on the ordinary laboratory animals, since they do not have a sudden menopause, and endocrinologists are trying to find out if there is a species of monkey or ape which follows the human pattern.

Grafting techniques have incurred disrepute because of the claim that human males could be rejuvenated by grafts of chimpanzee testicle—so-called monkey glands. Actually there is no graft, hormone, or other preparation known at present which is capable of producing more than a limited reversal of a very few senile changes in

human beings; but grafting techniques are of importance in the study of age changes, and may conceivably one day be of use in their treatment. At present we can only make age chimæras by exchange of smallish parts, such as ovaries or patches of skin, but we can also store tissues taken from a young animal and replace them in the same animal when it is old. Experimental work of this kind offers an extremely interesting and promising field of research.

Ageing and Evolution

One possible outcome of experimental research might be to show that the major age processes are quite different in different animals. The picture which we are forming of the place which ageing plays in the pattern of evolution seems to make a diversity of this kind quite probable.

Ageing may represent a single change—but it more probably represents a ragbag of all the loose ends left over from the provision of high fertility and vigour in early life.

I have once or twice used the word "programme" to describe the sequence of predetermined operations which an organism performs in the course of its development. I have borrowed this use of the word from calculating-machine and electronic engineering practice, where it means the sequence of operations which we feed into a machine to control its behaviour. Now when we say that an animal ages, we have been meaning that, as this programme continues, the animal's behaviour in response to injury and disturbance is becoming increasingly erratic—rather as the behaviour of some device would do if the signal controlling it were to become progressively weaker. This seems to be a useful analogy. An ageing organism becomes increasingly unstable as it runs out of programme.

There is a possible reason why this should be so, which may provide a clue to why animals age at all. The tight and stable programme which so neatly fits together the requirements of change and of constancy from egg to adult life is, we believe, the result of natural selection. As life goes on, that programme loses its sureness of touch, it goes to pieces; the adaptation becomes less and less satisfactory, the organism less and less buffered against change. That is what we might expect if the force of natural selection was less powerful in controlling the fitness of old than of young animals. For several reasons, it very probably is—bearing in mind that fitness, in Darwinian terms, means the ability to contribute the maximum number of live offspring to the next generation. A character which made for high early vigour, but impaired vigour later on, would always score higher in evolutionary terms than one which made for constant stability. In fact, there are many animals which so rarely reach even early adult life that, to stabilise them in late adult life, natural selection would have to be capable of favouring a character which never in fact appears except in the laboratory. In many animals survival even from egg to adult larva is less than one per million, and in such cases the selective importance of characters appearing early in life must be enormously greater than that of any character appearing late.

That view, which has been discussed by Prof. J. B. S. Haldane, and more recently by Prof. P. B. Medawar, is not the whole story, and there are plenty of cases where long life clearly would be advantageous, and has in fact been evolved—often in social animals, where the continuity of information or experience within the group is a favourable adaptation. But it is quite possible that the real unity between the senescence of moths, of elephants, and of men is that the decline in vigour with age is due in all of them to the accumulation in late life of all kinds of effects which would be eliminated by selection in the young animal but are effectively beyond the reach of evolutionary improvement in the old. Until, of course, the evolution in man of conceptual thought has made it possible for him to try to tackle them in himself.

Prolonging Useful Life

The practical undertaking we have in hand is to prolong the useful human life-cycle in time, either by squeezing and stretching it or by adding to it. We could theoretically do this in any of three ways: the developmental "programme" could be prolonged by the provision of new developmental operations; or its movement, throughout or in part, could be slowed down; or active life could be maintained after the decline of the built-in adjustment mechanism by piecemeal adjustment with supplements, medicaments, and prostheses of various kinds.

The first of these possibilities, though it is biologically the most interesting, does not merit discussion at present, at any rate in relation to man. We do not know enough about the developmental process to interfere with it clinically, except in a few simple deficiency states, let alone devise a sequence of self-regulating operations in growth or development subsequent to normal adulthood. The third possibility is already receiving the greater share of the energy devoted to clinical studies upon human ageing. Theoretically, the removal of successive causes of death should increase the expectation of life of the old as well as the young; but there is so far very little evidence of such an effect. It was once widely believed that with the removal of "pathological" causes of death the specific age would rise very rapidly in man and approach the recorded maximum, about 120 years; but it seems possible that even with increased control over malignant tumours and blood-vessel disease the age at death may only come to be more and more normally distributed about 75 or 80 years. Most people who die *late in life* from one of these causes also exhibit several other pathological processes which would probably have killed them very soon, had they survived the actual cause of their deaths. Such an assumption may well, however, be false, since the life curve has been extensively "doctored" by actuaries, and the material at high ages is statistically not very significant. We have certainly not reached the limits of the purely prosthetic and supportive treatment of old age, and we are unlikely to do so for a very long time.

There is a serious possibility of prolonging life by slowing down the movement of the developmental programme. This slowing, if it is to be of medical interest, must be compatible with normal vigour and activity. Prolongation of life by cold storage, which Harvey suggested, and which is now within the bounds of possibility, might be important for astronauts, or perhaps politicians, but I doubt if it would be generally popular. The prolongation of infancy is unlikely to be of interest, unless it also leads to longer adult life. The prolongation of that part of the life-cycle which lies normally between the 18th and 50th years of life, even by a small percentage, would come nearest to fulfilling our objectives. The prolongation of childhood presents special interest, since it is almost certainly possible by simple but heroic measures such as dietary restriction. Such a prolongation would have interesting social consequences, both upon the family and upon the acquisition of skills. It is also important to know whether our present pursuit of quick growth in children as a public-health measure is compatible with maximal adult longevity. It seems very probable that in most mammals we could alter the rate of development during the period before puberty, but we know of no way as yet of altering the rate of development after puberty. It is possible that the post-pubertal mammal behaves not like a caterpillar but like a moth—that its life-span is closely linked to metabolism, and that the fundamental change which leads to eventual senescence has already taken place at puberty. If so,

interference with the length of the adult phase *could* perhaps only be prosthetic.

I have not discussed the question which must interest us as adults—whether the established changes of senescence are likely to be reversible. I see no likelihood of producing de-growth in human beings as one can in flatworms; but, judging from the powers of repair which even old tissues exhibit under suitable conditions, I would put no limit on the amount of rejuvenation we could effect if we knew how.

There always remains the possibility that a substantial increase in the duration of healthy life might result from one particular adjustment. This was the hope which led to the use of sex hormones for the purposes of "rejuvenation," and which was disappointed. But it is still not beyond the bounds of possibility that one might find a single substance or a single manœuvre which might add substantially to the human life-span: if we were thinking of a hormone, the best place to look for it would, to my mind, be among the substances which regulate protein metabolism. A discovery of this kind would be a very good thing, no doubt; but it is unlikely to happen at all, and still less likely to happen through deliberate search, because we would not know what to look for. We cannot count on windfalls, and the only reliable way to find means of controlling age processes is through the type of systematic study—comparative, descriptive, and experimental—which I have been describing.

The documentation of this lecture is contained in *The Biology of Senescence* (London, 1956).

THE DEFENCE SOCIETIES

AT their annual general meetings this year the two English medical defence societies were both able to report that, though litigation had continued at a high level, it was at least no longer still rising.

MEDICAL DEFENCE UNION

Speaking at the meeting of the Union in Birmingham on Sept. 18, Dr. S. COCHRANE SHANKS, the president, said that "the rising graph of the past five years shows a welcome flattening of the curve." Of all the claims made against members, he continued, only a third were either settled out of court or lost in court. The remainder were either won or abandoned by the plaintiff. But, as many of the claimants were receiving legal aid, the Union was usually unable to recover any costs. Indeed the costs of two cases which the Union had lately successfully defended were more than £10,000, none of which was recoverable.

In their annual report the council reaffirm their approval to the procedure required by the Ministry of Health for the reporting of accidents in hospitals to the solicitors of the hospital authorities. They stress that the report must be given to no-one else and that no copy must be kept. If this condition is not observed, professional privilege cannot be claimed for the report. The council are satisfied that the agreement reached with the Ministry in 1954 for the defence of cases of alleged negligence by members of hospital medical staffs has proved an unqualified success; and they pay tribute to the coöperation offered by the solicitors acting for the hospital authorities.

The total membership of the Union on July 19 was 43,219. During 1955 the Union handled 2348 cases, precisely the same number as in 1954.

MEDICAL PROTECTION SOCIETY

This society met in London on Oct. 3. Sir ERNEST ROCK CARLING, the president, speaking from the chair, gratefully recorded the passage of an uneventful year. But the council, he admitted, were disturbed at the number of accidents that still happened—swabs got mislaid, blood and teeth found their way into the bronchi, people found it difficult to distinguish right from left, and tight plasters exerted their pernicious influence. To remedy this state of affairs he would like to see more done in the hospitals to instruct new recruits about hospital standing orders, and as a suitable instructor Sir Ernest suggested the records officer; for it was to him that the new arrivals naturally turned to learn their duties of keeping records, and he could very easily at the same time take them through the standing orders. Sir Ernest believed that the standing orders themselves should also be regularly revised and that the administrative staff should with the engineering staff regularly overhaul potentially dangerous machinery, especially in the operating-theatre.

Mr. W. G. HAWKINS, of Messrs Le Brasseur & Oakley, solicitors to the society, said that after eight years in which actions and claims had increased annually the flood of litigation at last showed signs of subsiding. There was, in his view, no cause for complacency; for, whatever the cause of the slight fall, human nature had not changed and the desire to seek compensation for a mishap remained. A doctor's best defence was always to maintain a high standard of skill and care; another valuable defence was to keep regular, full, and accurate records, for a judge was always apt to attach great importance to records made at the time of treatment.

The society's annual report shows that during 1955 members sought help in 2042 new cases and that the number of members on Dec. 31, 1955, was 29,638. The funds available for the protection and defence of members exceed £220,000, and in addition the society is reinsured for a considerable sum. The council is satisfied that these reserves are ample to secure the unlimited indemnity granted to members. Many interesting matters are reported and these include details of claims by patients against members, of members in conflict with their employing authorities, and of the successful outcome of an income-tax dispute between a member and the Inland Revenue. Attention is drawn to the implications of the Dentists Act 1956, the Witnesses' Allowance Regulations 1955, and a new Home Office circular issued to coroners and relating to deaths from industrial accidents and diseases.

Sir Ernest Rock Carling was re-elected president, Mr. W. M. Mollison treasurer, and Dr. Alistair French secretary. The chairman of council is Dr. F. Harwood Stevenson.

Public Health

Infectious Diseases in England and Wales

Disease	Week ended September				
	1	8	15	22	29*
Diphtheria	5	4	7	6	8
Dysentery	304	330	321	390	457
Encephalitis:					
Infective	1	2	3	2	1
Postinfectious	2	1	1	3	..
Food-poisoning	220	189	254	235	300
Measles, excluding rubella	1384	1092	932	1083	1396
Meningococcal infection	26	27	26	32	22
Ophthalmia neonatorum	21	23	34	35	27
Paratyphoid fever	6	8	6	7	9
Pneumonia, primary or influenzal	175	171	205	195	292
Poliomyelitis:					
Paralytic	53	37	46	39	60
Non-paralytic	74	68	65	72	71
Puerperal pyrexia	185	208	212	282	222
Scarlet fever	247	253	313	376	447
Smallpox	..	..	..	..	..
Tuberculosis:					
Respiratory	485	509	543	550	524
Meninges and C.N.S.	5	6	12	17	6
Other	68	70	78	49	66
Typhoid fever	9	15	4	9	5
Whooping-cough	2285	2315	2275	1851	1765

* Not including late returns.

Points of View

THE GREATER MEDICAL PROFESSION*

T. F. Fox
M.A., M.D. Camb., F.R.C.P.

OUR profession, as usually defined, consists (and consists only) of people who have gone through a prescribed training and gained a medical qualification. We do not recognise as medical anyone who has not had just the same sequence of experiences as ourselves: the frog, the dissecting-room, the nerve-muscle preparation, the P.M. room, the ward, the theatre, outpatients, and the examination hall. That is the course, and anybody who has never been round, or has taken short cuts, is disqualified and can never wear the club colours. But actually we are not the only people interested in health and disease, or the only people with brains; and the plain fact is that nowadays leading positions in medical research and teaching are held increasingly by men and women who do not happen to have taken a medical qualification—I am thinking of names like Harriette Chick, R. A. Fisher, J. Z. Young, C. Rimington, E. J. King, G. F. Marrian, P. B. Medawar, F. G. Young, Charles Harington (director of our National Institute for Medical Research), and Bradford Hill.

Perhaps none of us are always and wholly free from a feeling that, having survived the medical curriculum, we are entitled to a kind of respect not normally accorded to chemists, engineers, or geographers—and to corresponding amenities. We are conscious of having been anointed, if not by the Lord at any rate by the General Medical Council. Have we, I wonder, sufficiently adjusted ourselves to the change that is coming over Medicine?

If this change is evident in the upper reaches, where we thankfully use the ideas and discoveries of more and more associates who are technically laymen, it is even more evident in the lower reaches where so much of the everyday work is delegated to people whom we likewise regard as outside our profession. In days not so long ago, the doctor practised virtually by himself, without aids beyond perhaps a druggist to make up his prescriptions, or some sort of nurse to look after the patient. But the new world of medical technology is based on division of labour. The hospital doctor nowadays has the help of biochemists, physicists, and pharmacists; nurses, almoners, and records officers; laboratory technicians and radiographers; physiotherapists, occupational therapists and speech therapists, and chiropodists. And outside hospital, Medicine uses the midwife, the district nurse, the health visitor, the psychiatric social worker, the psychologists, the psychotherapists, the statistician, the entomologist, the public health inspector, the first-aider, and many another.

We shall need to give further thought, I fancy, to our professional relationship with all these people, and our attitude towards them. Take the nurses, for instance. They have formed a profession of their own which we recognise as such. They do an essential part of our joint work, and they do not do all of it, by any means, under direct instruction. Now the other day I saw a nurse describing herself in print as a member of the medical profession and therefore bound by its canons. Do you accept her view? Should we perhaps revise our ideas and regard everybody who does medical work as belonging to what one might call the Greater Medical Profession? I believe we should.

* * *

* Extract from an address, entitled The Medical Empire, delivered at the annual meeting of the Manchester Medical Society on May 2, 1956.

At present in this country most of the people engaged in medical work belong to the National Health Service, which organises what they do. But that does not automatically turn them into professional people; and if we want a Greater Medical Profession, in which everyone works to professional standards, we shall have to create it deliberately. For the normal tendency of a *service* is to turn all its members into employees working by rule—to destroy rather than foster their feeling that they are members of free professions.

Actually, in the National Health Service we have a new and important social experiment—a nationally organised service whose professional members can go on working almost as though they were independent professional people. If it succeeds it will come to be regarded as a brilliant example of British political adaptation—a demonstration that people can be paid out of public funds without changing their loyalties or their manner of work and without becoming subordinate officers of the Administration. But it may *not* succeed. And one reason for its possible failure is that a great many of its members, doing medical work, are not recognised as professional, while some of them do not even want to be so recognised. Both inside and outside the health service there are in fact many to whom it is a State industry whose workers need no vocational organisations other than their trade unions.

The differences between a professional and a trade-union outlook are not imaginary but real. A profession is a group of people united by sharing two things: (1) a body of knowledge which they try to increase and transmit to new entrants; and (2) a code of ethics, a set of standards which they try to follow in their work. A profession, however self-interested, always claims that it exists to serve the public; and, since people tend to act up to their pretensions, professional bodies do in fact very often strive to ensure that the public shall be better served. I think it is fair to say that this is neither the primary purpose nor the main preoccupation of trade unions which (both in theory and in practice), exist to protect and benefit their members.

We shall, I suggest, have to make up our mind whether we are going to encourage professionalism in others in the service or whether we are content to let the service become just another industry. Either we can have a health service of "workers," or State employees, whose interests are looked after by their appropriate union but who have no professional life outside the service. Or we can have one manned by members of free professions, working to the standards of those professions and stimulated by professional discussions and activities outside their working hours.—And here I must interpolate a protest against the remark, so often heard nowadays, that the medical profession has itself been nationalised. This could happen: it has happened in Russia; but it certainly has not happened here. Is the Manchester Medical Society nationalised? Or the B.M.A., or the Royal Society of Medicine, or the Royal College of Surgeons, or the defence societies? Though most of its members may contract to work in the service, the profession, as such, remains outside and independent.

My own view is that, since so much of the work of Medicine is henceforth to be done by people who are not doctors, we ought to encourage them to form themselves into professions, and help those professions to acquire responsibility and prestige as components of the Greater Medical Profession. But are we doing this? I do not think so. So far our attitude has been cautious to say the least.

In 1949 eight committees, with Sir Zachary Cope as chairman, were set up to consider the registration of eight kinds of "medical auxiliaries" working in the

health service—almoners, chiropodists, dietitians, laboratory technicians, occupational therapists, physiotherapists, radiographers, and speech therapists. In the majority report, signed by all the medical members, the emphasis was very much on the subordinate nature of the work of these skilled people; and the central council which was proposed as a registering body for them represented doctors more amply than it represented the auxiliaries themselves. Not surprisingly perhaps, this plan was not accepted, and agreement has not yet been reached on any variant. The almoners, for example, will not even tolerate the designation of medical auxiliary; they feel that they have their own body of knowledge and work to their own standards, not under medical supervision; and they regard their profession as a younger sister of medicine—not as a daughter. They are not prepared to be a Colony; they claim the status of a junior member of the Commonwealth of Medicine.

* * *

This parallel is, I think, a useful one. We are at present in process of turning our medical Empire into a Commonwealth, and we are having the same difficulties as in the political sphere. For its various parts are at different stages of development.

Take the dentists, for instance. To my mind dentistry is a medical specialty. But, rightly or wrongly, dentists have now been granted complete independence. Formerly the Dental Board was a subsidiary of the General Medical Council, but now it is to be entirely separate. The dentists (as Lord McNair said in the House of Lords) have thrown off the long tutelage of doctors; and they now have as much self-government as India.

But dentists never actually worked under doctors: they were never a Colony, and nobody can doubt their capacity to manage their own affairs. The situation is rather different when we come to (let us say) the physiotherapists. Here we have what is unquestionably a Medical Colony (complete with a warlike minority in the mountains); and we should be wrong in disclaiming all further responsibility towards the inhabitants, if only because their work for patients is very much part of our own.

The problem is, in fact, not easy. On the one hand we know that when people come to think of themselves as professional they take more interest in the progress of their art, and are ready—even at a sacrifice—to abide by higher standards of practice and conduct: the leaders of a new profession press for better training, higher standards, and strictly ethical behaviour. On the other hand, we also know that a physiological desire for upgrading can easily become a pathological desire for aggrandisement. Instead of being content to help the doctor, the auxiliaries may insist that the vital importance of their labours demands more and more technical knowledge and added years of training, thus justifying ever higher pay and nearer equality with doctors. Even nurses, in their General Nursing Council, seem to have lost touch at times with what the public needs—their leaders working always towards more elaborate training and examinations.

These are real risks. Nevertheless, on the analogy of political empires, we should be well advised to avoid making our concessions too small or leaving them too late: we should show ourselves as reasonable elder brothers, not as rulers who are being pushed. For my part, I believe that, if we want our medical Commonwealth to hold together, it is safer to err on the side of too much self-government than of too little: I believe that our Greater Medical Profession will run better if we go as far as is reasonably possible towards granting full professional status to every kind of trained person in it.

* * *

But what will be the position of the doctor in this altered situation? Will he become just one expert among many? I do not myself think so; because, with all its changes, medical work still arises from an appeal from a sick person who wants help, and that appeal is normally made to a doctor. So long as it is answered by a doctor, who retains responsibility for whatever is done for (and to) the patient, the doctor's position remains essentially what it was.

As the man in charge of the patient, he is the natural leader of the medical team—the chairman, if you like, of the committee of experts that decides what is to be done. But we must not forget that every addition to the number and variety of people concerned with a given patient increases (rather than decreases) the strain on the judgment and resolution of the person responsible for that patient's welfare. What would be fatal to the doctor's position and true usefulness is that he should refuse this challenge—that he should come to think of himself simply as the diagnostician or therapist of the team, and not as the person who must consider every aspect of the patient's case and make the final appreciation. In other words, to hold their own in the Greater Medical Profession, doctors will need to be very good doctors.

The system so rapidly developing in this country by which more and more of the medical work is done by people without a medical qualification means that we certainly need not ask our medical schools to raise their output. We need not follow the example of Russia, where even the 25,000 students who qualify each year are too few, because there is so much work of a comparatively simple kind waiting for them to do. What it does mean, however, is that most of the doctors we do turn out must be qualified not only to practise but also to coöperate and lead.

In considering the status of workers in the health service the deciding factor, of course, should not be the interests of the group in question, or of our own group: it should be the good of the patient. Very real harm might be done to the patient if the various technicians succeeded in establishing empires of their own to which nobody else was admitted. Already we see, for instance, the physiotherapist who thinks herself entitled to the last word on the position in which the patient is to be placed for postural drainage of the chest—because her books say so. But even the arrogance of partial knowledge can be gradually overcome by the physician who takes trouble to explain; and the technician, like the medical student, can in the end be made to understand that we are treating patients, not diagnostic labels. Against the harm done by this arrogance we have the good done by the added sense of responsibility—the professional person's feeling that, within the limits of the task, he or she is directly responsible to the patient for the quality of the care given or the work done. This is something quite different from the merely honest attitude: "I'll do the work I'm paid for."

* * *

To my mind the unanswerable reason why we should accept the so-called auxiliaries as members of the Greater Medical Profession, and welcome them as colleagues, is that we want them to go on sharing with us that very difficult but very important professional code according to which the patient's interests come first. In a service which, after all, exists solely for patients, this code is as valid for the radiographer and the records officer as it is for the surgeon: they should equally accept, for example, the obligation to respect professional confidence. We have a great tradition, and we have a duty to pass it on to all our associates who will accept it. Though the practice of Medicine now depends on so many who never went through our schools, the virtue need not, and must not, go out of it.

The Widdicombe File

XXXIV. CLINICOSIS

Dear UNCLE TOM,

You will by now have heard that at long last I managed to deceive the Censors. Scarcely had our President spoken the formal word of congratulation before Father was ringing relatives far and near with the glad tidings. With some time on my hands at last, and a song in my heart, I feel the urge to write you a letter: the first I think (and I apologise deeply for it) since the time the boys painted the Albert Memorial green.

Since your day, we believe, these postgraduate hurdles have become more numerous, higher, and trickier. Hence the need for three-month courses in this and that (chests, skins, C.N.S., and so on); hence the need to turn an honest guinea during the odd free half-day; and hence my introduction to your Welfare Service. Happily I hit the time when clinic doctors go away, and after a breezy interview I found myself shooting round half the county running clinics of a diversity quite beyond my previous comprehension. One moment I was feeling pregnant tummies; the next, ten miles away, giving dental gases; the next pushing in combined prophylactic; and so forth. When the initial bewilderment had worn off, the thought came slowly over me . . . Why?

Now your Ante- and Post-natal clinics are out of my sphere, so I shall pass them by on the other side; and anyway I reckon that anything which keeps folk away from hospital is a good thing.

Next up is the Infant Welfare. I wonder. There is a long cold room with a row of dreamy Mums each bearing a naked shivering infant waiting . . . for something . . . For what? To see me? To see the Health Visitor? To be weighed? I haven't yet found out; but anyway I go into my little room, which is like the vestibule to a public lavatory, and advise on selected problems. Mum has already, I eventually discover, had advice from the G.P., his Assistant, the Health Visitor, the District Nurse, and at least one Hospital, not to mention the lady in the W.V.S., the Churchwarden, the Chemist, the Grocer, and four neighbours. I cannot prescribe even if I wanted to (just as well, as she has four bottles already which she gives in turn) and I am limited to an offensive duplicated ultimatum to the G.P. telling him that unless he does something jolly fast I am going to send his case to a Specialist and Serve Him Right. Otherwise I have to restrict myself to platitudes and an essentially reassuring rôle.

I suppose regular weighing is a good thing, but in my Clinics it seems to be a sort of competitive sport, with the Health Visitors cheering from the side-lines and throwing tins of Full-Cream National Dried to the competitors. Why oh why do we have to praise the obese infant and commiserate over the child whose weight is merely "normal" for age? One Mum last week complained that her four-month babe vomited after its feeds. It was just twice the (old-fashoned) ideal weight, and in the last one week had *gained no less than one and a half pounds*, yet she was incapable of grasping the logical conclusion: to the Welfare Mum overfeeding just does not exist. This obesifying F.C.N.D.M. is given earlier and earlier in life, and solids are started earlier and earlier. Why? Is this really Nature's way? Are we sure that it may not do harm? Boyd (*Pathology of Internal Diseases*, 1950, p. 105) says that the earliest signs of atheroma are often found in infancy, and you know what your favourite journal says about high-fat diets! Is the price of the abolition of rickets to be an enormous increase of coronary and cerebral thromboses? Are we at the beginning of a Welfare-engendered epidemic of these diseases? Rickets didn't really matter very much after all, it was rarely fatal and readily treated. It is all too easy in child-rearing to advance very rapidly backwards. In India, where Truby King made no impact at all, the Mothers have suddenly found themselves at the forefront of Scientific Progress and Enlightenment: their demand-feeding technique anticipated our learned Pædiatricians by some five thousand years.

Then I discovered a thing called a "Toddler's Clinic." To this, as I imagine you very well know, children are called yearly for a routine check-over; 20 to each two-hour session. Needless to say, the 3 who come are well cared for, happy, and healthy. The Mothers who need the advice are the ones who don't care, and are probably out at work all day anyway. I put it to one of my Health Visitors that this did seem rather a waste of time and money. An elderly and amiable soul, she pondered this entirely new idea and was troubled by it. After an afternoon's careful thought she recollected a child some three years before that her clinic had diagnosed as T.B. Hip very early from a positive Patch Test: after this she was happy again. Doubtless this was a praise-worthy achievement; but one wonders, compared with the other things that need doing, whether by itself it justified the existence of the clinic.

Of the School Clinics I know little, but Cousin George, who wears gracefully the wrinkles of ten years in general practice, expresses himself forcefully. He actually says (I can scarcely believe this) that they do more harm than good, and that he spends hours sorting out the innocent murmurs that they keep on finding and worrying everyone with. George is good of course, and doesn't happily tolerate other Doctors messing about with his patients, however well-intentioned they may be. He mutters about ethics and things, and his flow of language when a case gets sent to a specialist would surprise you. George says that the School Doctor knows less pædiatrics, less about the child, less about his family, and nothing about the treatment he has been getting. Perhaps he goes too far in taking all such refereeing as a personal insult.

I must agree, however, Dear Uncle, that there seems to be nothing done in the Welfare that a sound and keen G.P. couldn't do just as well if not a good deal better. Granted that his Surgery is often less pleasant than the Welfare, granted Mums don't like sitting in a waiting-room full of aged bronchitics, and granted that he doesn't always have time and energy to weigh and immunise—but so what? Recognise the willing and competent G.P. for Welfare work and let him have a special afternoon clinic, lending him the services of the Health Visitor. Spend some of the Welfare money improving his surgery, and making the whole thing worth his while: help him perhaps to take the D.C.H. Make it possible to shorten his list and give adequate attention to his patients. He knows the problems of his families far better than the Clinic Doctor ever can, and would bring a fuller meaning to the word "Welfare." And don't forget, Uncle, that it is a Clinic Doctor cum Embryo Specialist writing this, reluctant as he is to attempt the life of the goose which has laid him such golden eggs.

In conclusion, Uncle, please don't be offended when I suggest that you take some clinics yourself to see the nonsense that goes on. When you have had your basinful of obese babies, drive at 10.15 P.M. slowly towards the East and see how many of your clinic children you can count, pale and heavy-lidded, waiting outside for closing-time; and Mum. Then ask yourself if you know what this strange word "Welfare" really means.

Your affectionate if slightly
disenchanted nephew,
RICHARD COBBLEIGH
M.B.C.P. (and proud of it).

Conferences and Congresses

LIVER CANCER

A CONFERENCE on liver cancer was held in Makerere College Medical School, Kampala, Uganda, from Aug. 23 to 31. It was organised by the committee of geographic pathology of the International Union Against Cancer, and hospitality in Kampala was arranged by the British Empire Cancer Campaign, the Colonial Office, and the Medical Research Council. The twenty-seven delegates included representatives from Europe and North America, French, Belgian, and Portuguese Colonial Africa, South Africa, Japan, India, British West Indies, and Uganda.

Primary carcinoma of the liver is commoner in Africa than in Western Europe or the United States. J. N. P. Davies (Uganda) and J. Higginson (South Africa) emphasised that this tumour accounts for a high proportion of all the cancers encountered, and this proportion exceeds that found in other parts of the world. It is very difficult, however, to compare values found in the United States and Europe with those in Africa. In Africa the average age of the population is lower, and with increasing life-span the incidence of liver cancer might be even higher. Necropsy material provides the most valid data for statistical analysis, and the number of necropsies depends on hospital and pathological facilities and the religious beliefs of the community.

It is generally agreed that primary liver cancer—and the hepatocellular rather than the cholangiolar—is commoner in the cirrhotic than in the non-cirrhotic liver. The frequency depends on the criteria used to diagnose cirrhosis, and the members of the conference decided that the morphological diagnosis of cirrhosis depends on the presence of an increase in connective tissue, disturbance in normal hepatic structure, and regeneration of liver cells. Increase in connective tissue alone should not be termed cirrhosis. Fibrosis per se is not mild cirrhosis, nor is mere bile-duct proliferation. In particular, the stellate portal-zone fibrosis so common in some parts of Africa cannot be termed cirrhosis. There are great geographical differences in the frequency of cancer in the cirrhotic liver. It is impossible to give final figures for the various countries; but there does seem to be a particularly high association (greater than 40% of cirrhotic livers) in Johannesburg, Portuguese East Africa, and Indonesia. Frequencies of 15–20% have been reported from many countries in Europe and also from Kampala. A lower frequency (less than 10%) is reported from North America, British West Indies, and India. The ætiological factors concerned in the development of cirrhosis must be very different in these various parts of the world, and the above figures emphasise that at present no particular pattern can be defined correlating primary cancer of the liver with any particular cause of cirrhosis.

The large numbers of liver cancers found in Africa might be due simply to an increased frequency of cirrhosis in the population. It is, however, extremely difficult to obtain even a general idea of the frequency of cirrhosis in African peoples. The increased susceptibility of the African to liver cancer might be genetic. This seems unlikely, for the statistics quoted by H. F. Dorn (U.S.A.) and P. E. Steiner (U.S.A.) showed that the Negroid race living in the United States, and originally derived from West Africa, has the same frequency as the Caucasian race in the United States and considerably lower than the African living in Africa.

A. Tannenbaum (U.S.A.) gave an excellent review of nutritional factors in experimental hepatic cancer. The genesis of carcinogen-induced hepatic cancer may be modified by changes in dietary calories, protein, fat, or riboflavine. S. Hartroft (U.S.A.) had noticed hepatomas developing in the choline-deficient mouse. Many of the peoples living in areas where liver cancer is common receive grossly deficient diets, particularly in protein. The possible relation of liver cancer to nutrition and dietary liver injury was therefore considered. Kwashiorkor, a clinical syndrome in infants and children closely associated with protein malnutrition, is marked by fat in the liver. But there is now general agreement that the fatty liver of kwashiorkor does not lead to cirrhosis. J. H. Dible (London) noted that the fatty liver found in England also did not seem to be associated with hepatic fibrosis. Some areas, such as Johannesburg (J. Gillman, J. Higginson), Uganda (J. N. P. Davies, H. C. Trowell), and Cape Town (J. F. Brock) have a high incidence of both liver cancer and kwashiorkor, but this is not true of other areas such as Jamaica (J. C. Waterlow) where kwashiorkor is common and liver carcinoma unusual. The conference suspected that nutritional deficiencies, particularly if sustained early in life and recurrent, predisposed to liver cancer, but it could not produce concrete evidence of this.

Chemical carcinogenosis—for instance, by butter-yellow—is well known. The high frequency of liver cancer in Africa could be related to possible carcinogenic agents taken in food or drink. Further studies are needed of the biological effects of food, beverages, condiments, and drugs consumed in areas where liver-cancer rates are high.

A. Cantarow (U.S.A.) described the modification of experimental cancers by hormones. In Africa primary liver cancer is much commoner in the male, and the African male tends to show signs of hormonal imbalance such as a feminine configuration. These observations indicate that the endocrine relationships in these people should be further studied.

M. Prates (Portuguese East Africa) related schistosomiasis to the very high incidence of liver cancer in that country. R. Camain and M. Payet (French West Africa) discussed the general reticulo-endothelial proliferation and serum-globulin increases constantly found in the African from the age of six months. It was agreed that cancer of the liver in Africa is imposed on a background of infectious disease, nutritional deficiency, and hormonal imbalance. There is an urgent need to collect more data on the world-wide instances of undernutrition, cirrhosis, and liver cancer. Moreover, normal standards are uncertain in many areas. Experimental studies in animals should be instituted, duplicating environmental conditions in areas of the world where the frequency of liver damage is high. These studies should be continued through several generations.

STUDENT MENTAL HEALTH

FROM A CORRESPONDENT

EXCEPT in the United States the study of the mental health of students is a post-war development. In Britain hesitancy to venture far into this field has been, in part, a reaction to an apparent over-development of psychological self-consciousness in some American universities. But in Britain, since the war, growing experience in university health services has made it impossible for university medical officers to ignore the evidence of poor mental health in many of their student patients. Dealing with real distress and serious impairment of intellectual and social potential has become a large part of the routine work of every university medical officer with the inclination and ability for it.

The university medical officer is not consulted by all of those in need. Some students seek help from non-medical sources, others feel to blame for their difficulties and are ashamed to confess a need for help. Accordingly the true incidence of emotional disturbance is difficult to assess, but it is the experience of every university medical officer active in this field that the better known

he is in his university the more often is he consulted by students either directly or referred to him by university staff. As a result he is liable to be accused of making "cases" out of normal adolescent problems and of encouraging over-dependence and morbid introspection. But in psychological as in physical medicine not all the pains of the young are "growing pains."

It is not in Britain alone that knowledge and experience of student mental health has developed since the war. On Sept. 5, at Princeton, New Jersey, U.S.A., representatives from ten countries met in the first International Conference on Student Mental Health. The conference, which lasted ten days, was sponsored by the World Federation for Mental Health and the International Association of Universities with financial support from the Grant and the Field Foundations of New York. This was designed as a working conference, and the thirty or so participants, who included four senior students, were from countries with practical experience in student mental health. The chairman was Prof. Dana Farnsworth (Harvard); and the participants from Britain were Dr. J. R. Rees, Dr. Nicholas Malleson, and Dr. Brian Davy.

The main work of the conference was done in discussion, which covered many practical and theoretical aspects of student mental health and associated educational, social, and cultural fields, ranging from methods of classifying and treating the emotionally disturbed student and of promoting mental health to the problems of formulating a working definition of student mental health applicable to any culture.

Detailed consideration was given to the results of students failing to complete the university course. It was felt that guidance and sometimes treatment should be available for the student who drops out. Surprise was expressed at the complacency with which some communities accept the heavy financial burden of a high drop-out rate among grant-aided students. The important topic of the effects on student mental health of poor mental health in university teachers was also considered.

Those who fear that expansion in student mental health facilities must inevitably undermine independence of spirit and weaken the traditional rôles in the university educational system should be reassured by the repeated emphasis in the conference on student maturity as the goal of all treatment and research, and also by the general conviction that student mental health is the concern of the whole university, that medicine has no monopoly in this field, and that progress can come only through better understanding and closer coöperation between all university staff in contact with students.

Apart from the value to individual participants of this first opportunity for the extended interchange of ideas and information from many parts of the world, there will be three tangible results of the conference. The first, prepared for the conference by two of its members, is an annotated bibliography of over 1800 books and papers relating to student mental health published between 1936 and 1955; this will be on sale in Britain shortly. The second will be a short report summarising the main conclusions of the conference. The third and most important result will be the publication, in about a year, of a book on student mental health based on the pooled experience and conclusions of the conference members, as they were expressed in previously submitted papers and in the discussion sessions. The work of the editor, Dr. Daniel Funkenstein, of Harvard Medical School, will be greatly eased by the large measure of agreement reached at the conference. Despite the cultural and educational differences between countries, participants found that they had a great deal in common with each other as regards the fundamentals of their experiences amongst their students and the conclusions they had reached.

In England Now

A Running Commentary by Peripatetic Correspondents

ONE of the duties of an assistant medical officer of health is to conduct foreign visitors around our local medical services. Last week, for the first time, we had some Russian guests, three charming lady doctors who were part of a larger party of Russian tourists, visiting Great Britain for the first time. They had only an afternoon in which to see a cross-section of our medical organisation. So off we set briskly—Drs. Olga, Tamara, Vera, and myself, and, as none of the ladies spoke any English, Madame Zena, our interpreter.

Our first call was to a new housing estate, where we watched a children's clinic in action and, at the ladies' special request, visited some homes. The housewives were delighted with their visitors and, in no time, were comparing notes on the problems of housekeeping here and in Leningrad. As far as I could gather there was little difference. Cupboard-space is still a problem.

From there we went to a hospital where we were met by the distinguished chief who had cut short an important board meeting in order to be present. He took us to the virus laboratory, one of the most modern in the country, and our visitors were duly impressed. Some lively discussion followed on polio as seen here and in Leningrad. From there it was only logical that they should go to the new polio unit. Recently completed, it is as up to date as time, money, and research can make it. Here discussion became so lively that translation was well-nigh impossible and the ladies had, as it were, to queue up for their answers. A quick glance at the teaching unit and, as time was pressing, we had reluctantly to bid goodbye to our distinguished guide.

We then toured some of the older housing areas and visited a children's home. There, I was glad to see, tea was as welcome in the middle of a busy afternoon to a Russian as to ourselves. The talk covered so many things that Madame Zena and I became slightly hoarse.

As our visit drew to a close, the ladies asked if they might visit my own home and meet my wife. So, in a short time, after a hurried phone call, we were sitting round my fireside. My medical duties temporarily laid aside, I listened to my wife and the ladies engage in a non-medical discussion. At one point my wife and the lady doctors moved to our curtains, discussing the material, while Madame Zena and I looked on in amazement. Apparently there are no language difficulties when it comes to interior decoration.

Regretfully I took the ladies back to their hotel where we said goodbye. I was by then smoking long Russian cigarettes and in my pocket were some postcards of Leningrad. As I returned home, I thought gratefully of the gaiety and good humour of our visitors and the ease and pleasure with which they met and were met by our townsfolk.

* * *

I suppose we have all dipped into the personal columns of the *Times* and wondered whether "young journalist, wife, and baby" will ever find a small inexpensive flat or "determined resourceful independent young man, single" the interesting vocation he seeks. Occasionally our patients join the column and I was delighted when I was given the chance to look at the postbag sent in response to the following appeal:

OSTEOARTHRITIS in finger joints—Sufferer would be grateful [illegible] for any advice on how this condition can be arrested.

In all there were 65 letters. The following is a therapeutical pot-pourri of the suggestions:

Balm for rheumatism, then rubber gloves and hands in hot water for ten minutes; book by Health Association; a foreign practitioner (but what kind not stated); lemon juice every morning; painful injections and a lamp used by doctor (nature unknown); osteopath (name and address and telephone number given and professional card); colonic irrigation by retired nurse; husband or wife will help (but does not say how); foreigner will help (but does not say how); S. American maté tea, also eat plenty of fresh parsley, asparagus and celery; go and live in Barton, near Torquay; spiritual healing—"some doctors approve"; consult a

homeopath who must also be a naturopath—orthodox medicine no good; diet and treatment as a residential patient near Hastings (15 gns. weekly); olive-oil and eau-de-cologne in equal quantities; have tonsils removed; plastic splint (type unspecified); Hungarian fungus from Andover, but cannot be sent by post; movement and exercise—exercise of will-power.

On the whole they surely show more interest than self-interest.

* * *

Funny things racing pigeons. One adopted us—at least it slept on our roof and ate our breadcrusts for a week. Then I managed to catch it and look at the ring on its hindleg. I traced the owner and rang him up. He was not at all pleased. "Wring its neck," he said. "If it were any good it would have come home." This would not do for my wife, who has feelings about taking life, even where pigeon-pie is concerned. The journey across country was not very difficult, at least not insuperable, and I gave up my Saturday afternoon off to carrying a large cat-basket full of one frantic pigeon from bus to train and train to bus and so to its owner. He was even less pleased, and offered me neither subsistence nor travelling allowance. When I left him I would not have given much for the bird's chances of survival. I need not have worried; next morning it was back on our roof. Do I wring its neck, or is it a champion?

* * *

I dislike going to the photographer more than I dislike going to the dentist, but when my colleagues decided that they wished to assemble a sort of rogues' gallery of the consultant staff, I felt it my duty to oblige them. My latest portrait, made thirty years previously for a forgotten girl friend, was clearly unsuitable, and with a sinking heart I made an appointment at a studio in Bond Street. I was luckily able to park within a quarter of a mile of the photographer and, lighting my pipe, I got out of the car. Rain appeared imminent so I grabbed up an umbrella and strode off. As I rounded the corner into Bond Street, I noticed a smell of burning and I looked down to see smoke pouring from the umbrella (which I had been using as a walking-stick). A moment later flames appeared. I dropped the umbrella into a providentially situated puddle in the gutter and danced on it, reflecting that the six people who had witnessed the affair might more properly have shown admiration at my presence of mind than an abandoned display of merriment. As I entered the photographer's, carrying the charred skeleton, it occurred to me that my pipe must somehow have discharged a glowing ember into the umbrella as I got out of my car, but it was not until I was actually before the camera that I thought how easily other pieces of burning material might have fallen into the car itself. Sternly commanding my emotions while I listened for the sound of fire-engines, I placed myself as the photographer directed, hiding my hands to conceal the smudges of soot on them.

In fact all was well, but when future generations contemplate my photograph, they may well comment on my anxious expression and speculate on the association between duodenal ulcer or piles and a modest success in consulting practice.

* * *

The rain does go on, doesn't it? I expect you're tired of wisecracks about the alleged summer, but I'm feeling rather smug. While others bewail the ruin of their holidays I can look back on ten happy days. You see, I found the perfect holiday. Perfect, that is, for anyone of my advanced age for whom the word holiday is synonymous with rest as well as change.

If it rained, we curled up in a comfortable chair with a book, slept on wonderful beds, or sewed and listened in. Our meals were brought to us, the temperature was kept at a steady 65°, and, if we showed the slightest sign of being off-colour, a doctor attended without our waiting in the surgery. So long as we kept 30 ft. from our fellows we enjoyed country walks. Even while lazing we felt we were of use to our fellow men, for we had offered ourselves as guineapigs for medical research. Now when our patients get the common cold we shall feel that we've done our bit to help. And what is more you are paid for your pleasure.

Letters to the Editor

CHRISTMAS GIFTS FUND APPEAL

SIR,—I shall be very grateful if you will spare room for me to remind your readers that Christmas will be coming round again soon, and to ask them to give a kind thought and a generous gift to the beneficiaries of the Royal Medical Benevolent Fund.

To those of our colleagues who have fallen by the wayside, and to the widows and children of those who have passed away, a little cheer at Christmas time means much more than the gift itself. It is especially heart-warming for them to be remembered by members of the profession who are in a position to help them. I earnestly beg all your readers to send contributions marked "Christmas Gifts" to the Secretary, Royal Medical Benevolent Fund, 1, Balliol House, Manor Fields, Putney, London, S.W.15.

WEBB-JOHNSON
President,
Royal Medical Benevolent Fund.

CLASSIFICATIONS OF NEPHRITIS

SIR,—Classifications of nephritis must remain purely descriptive until the pathogenesis of the different forms is better known. Hence the recent experimental work using fluorescence microscopy, to which you refer in your leader of Sept. 29, may pave the way to a clearer understanding of the glomerular changes of nephritis in terms of immunological response, and may also explain why these changes are sometimes mixed. Thus when the action of anti-kidney serum on antigens has been shown to take place in the glomerular basement-membranes the result is a thickening regarded as typical of type-II nephritis. But in experiments where the antigens (bacterial) have been demonstrated in the glomerular cells the histological response is that of type I (not II, as stated in your leader). The site of the antigens in the glomerulus thus seems to determine the type of histological change. Were it to be shown that, in the evolution of glomerulonephritis, the antigens shifted from cells to membranes, or vice versa, a rational explanation would be found for those mixed forms of the disease that evade classification either as type I or type II.

The London Hospital, E.1. DOROTHY S. RUSSELL.

SIR,—In his Croonian lectures published in 1942 Sir Arthur Ellis was not primarily concerned to produce a comprehensive classification of nephritis. His lectures were entitled "The Natural History of Bright's Disease." They were based on a ten-year study which aimed to correlate the clinical and histological features of the various forms of Bright's disease throughout their courses. In this emphasis on the *courses* of nephritis Ellis followed the example of Volhard and Fahr, but with two advantages: first, that recent experimental work on hypertension had clarified the relation of high blood-pressure to structural changes in the kidney; second, that the clinical and histological studies were made by the same observers. A factual analysis of some 600 cases, with 200 post-mortems, clearly indicated that glomerulonephritis included two distinct pathological processes, one of (usually) abrupt onset which was in most cases reversible, the other of insidious onset which was in most cases progressive. To avoid introducing new "descriptive" terms these were named type-I and type-II nephritis. The practical importance of this separation is obvious for prognosis and also in assessing the results of new therapy (e.g., cortisone); for it is impossible to assess the therapeutic response to new drugs unless the natural history of the untreated disease is clearly understood.

As to detailed histological changes and "mixed types" to which your leading article refers, type-II nephritis sometimes shows exacerbations during its course and hæmaturia may well occur. In such a case, or even where continued activity has been indicated by persistent microscopic hæmaturia, epithelial crescent formation may be seen in a few glomeruli. Ellis was not concerned to show that any individual lesion of the glomerulus was specific for a particular type of nephritis; he attempted rather to demonstrate that the pattern and progress of histological change had a separate natural history in the two types, which corresponded to the clinical picture. There is a close analogy with the two manifestations of rheumatism which we call acute rheumatic fever and rheumatoid arthritis. The separation of these as two distinct forms of collagen disease is in no way invalidated because occasionally patients with rheumatoid arthritis are found to have rheumatic carditis, or because in both disorders acute fibrinoid necrosis may be found in the tissues, or because there are (as in nephritis) indeterminate forms which merge into the other collagen diseases. The old terms "acute hæmorrhagic nephritis" and "subacute œdematous nephritis" have, as they had fifty years ago, a certain descriptive value in relation to "cross-sections" of Bright's disease, but they convey nothing of course or prognosis and they remain unsatisfactory because the syndromes they describe may be due to different pathological processes.

The London Hospital, E.1. HORACE EVANS
CLIFFORD WILSON.

POLIOMYELITIS AND THE SEASONS

SIR,—Dr. Warren Browne's letter last week raises again the vexed question of the free supply of washing facilities in public lavatories. It is gratifying to learn that in his own city free washing facilities are available. This must be a rare arrangement; yet what ordinary person is going to spend 3*d*. on what he probably regards as an unnecessary frill? Exhortations on doors and walls to "wash your hands now please" are unlikely to be heeded so long as their fulfilment causes an added financial outlay.

London, N.W.9. J. D. OWEN.

SHORTAGE OF MIDWIVES

SIR,—I think that Mr. Terence Robinson (Sept. 8) is right in saying that the future of the maternity services depends on an adequate number of trained midwives. The reason for the present shortage of midwives is that apprehensive obstetricians up and down the country give no incentive to trained midwives to use their knowledge to the full.

In most parts of the country 75% of patients are delivered in hospitals. These hospitals have insufficient staff and beds to cope with such a large turnover of patients. The result is that patients have to be discharged early and hospital midwives see their patients for no longer than 2–7 days after delivery; while the district midwives have a sense of frustration from having to nurse so many patients delivered in hospital and very few of their own delivered on the district.

As for the pupil midwives, I agree with Mr. Robinson that there might be some introduction to midwifery during general training, to stimulate their interest. As it is, they see in part I large numbers of abnormal cases in the treatment of which they are not allowed to participate. The turnover of patients being so great, no-one has time to give the pupils any individual attention which would help to allay their apprehensions. This makes them thoroughly frightened of going on with their training or of having a baby themselves. So, as many jobs require only the first-part training, they naturally refuse to take the second part and thereby become fully trained.

If the attitude of doctors is that district midwives are no longer necessary, and that hospital midwives are to be only "maternity nurses" who are overworked because of the rapid turnover, then why, says the nurse, should I take the trouble to train as a midwife?

Royal Nursing Institute, London Road, Derby. BERYL D. THOMAS
Superintendent of District Midwives' Home.

INSULIN AND CHLORPROMAZINE IN SCHIZOPHRENIA

SIR,—We read with great interest Dr. May's letter (Sept. 22) criticising our article. We agree with some of his comments, but after all we made no very extravagant claims. We feel that some of his points cannot be left unanswered.

Firstly, the shorter stay in hospital of chlorpromazine-treated patients cannot simply be explained by the imponderable factor of further treatment, for either fewer patients in the chlorpromazine group needed further treatment or they needed a shorter course of this.

Secondly, our paper dealt with an investigation into the treatment of schizophrenia, certain data of which were subjected to the χ^2 test. This procedure does not invalidate other conclusions appertaining to data assessed non-statistically.

Thirdly, Dr. May reiterates much of what we had already stressed in regard to past investigations and their shortcomings. We would draw his attention to the fact that all our conclusions were in fact based on immediate results only, and that we had embarked on a two-year follow-up of all the cases so investigated. This already suggests that, in the thirty cases so far interviewed, chlorpromazine is in fact the better form of treatment.

Lastly, Dr. May does not consider the observation that we felt most needful of emphasis. There is nothing in our study to suggest that insulin has any advantages over chlorpromazine, and the latter is undoubtedly a safer and simpler form of therapy.

Springfield Hospital, London, S.W.17. R. H. BOARDMAN
J. LOMAS
MORRIS MARKOWE.

BILIGRAFIN FOR HYSTEROSALPINGOGRAPHY

SIR,—We can confirm views expressed by Mr. MacGregor and Dr. Sheach (Sept. 29). 'Biligrafin' would appear to be quite satisfactory as a hysterogram medium[1]; in fact we use the more concentrated 'Endografin' with no untoward effects. In Professor Jeffcoate's unit the medium has now been used in some 30 cases with good results. We have investigated the mode of excretion by means of serial films, and the findings confirm the accepted view that excretion is into the gastro-intestinal tract. The bile-ducts and gall-bladder fill rapidly and this fact is of some practical value in the investigation; so far we have not demonstrated the medium in the urinary tract as described by your correspondents. It is true that pelvic collections seen 30–45 minutes after injection can look like the bladder, and it is also true that vaginal shadows are seen if the medium is not removed from the fornices, but these should be readily distinguishable from a cystogram.

Liverpool Royal Infirmary. D. N. MENZIES.

APHONIA ASSOCIATED WITH TUBERCULOSIS

SIR,—The following case is somewhat unusual:

In 1950 the patient, a man then aged 49, was found by mass radiography to have pulmonary tuberculosis, of which he had no symptoms. Thereafter he was admitted to hospital more than once and received large amounts of antituberculous drugs. On Nov. 11, 1955, he was admitted to Holywell Hospital because of poor general condition and dyspnœa, and a course of antituberculous drugs was started. Radiography at the time of admission showed "contracted left lung with considerable disease in all zones and pneumonic

1. Menzies, D. N. *J. Obstet. Gynæc., Brit. Emp.* (in the press).

consolidation in the upper zone. Right lung: diffuse infiltration in all zones."

On Aug. 7, 1956, he lost his voice. Examination of the larynx showed complete paralysis of the left vocal cord; the right vocal cord did not move across the midline. The ear, nose, and throat specialist confirmed these findings and found that the trachea was rotated anti-clockwise and that the right cord was unable to meet the left. The patient has since remained aphonic.

Apparently in this case a recurrent laryngeal nerve is involved as a result of the tuberculous infection.

Holywell Hospital, Watford. N. D. J. DA S. WIJESEKERA.

B.Z.55 IN JUVENILE DIABETES

SIR,—In all reports available it is stated that B.Z.55 is without effect in juvenile diabetes, and may even be contra-indicated.

We have tried B.Z.55 in diabetic children in a dosage as high as, or even higher than, in adults and in some cases we have noted a substantial effect. The blood-sulpha concentration has been as high as 60–70 mg. per 100 ml. in the initial phase of treatment, and the maintenance dose varies between 1 g. and 2 g. daily. Apart from sulphonamide skin rashes, no toxic manifestations have occurred. In our experience the best effect is obtained in new cases in which the insulin dosage is low and where there probably is still substantial endogenous insulin production.

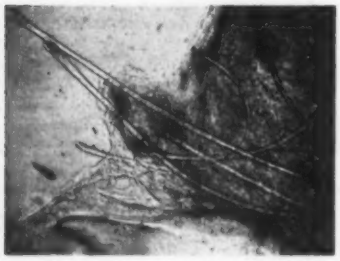
We believe these new preparations are of limited value in juvenile diabetes, although in our opinion all children would derive some benefit, provided the dosage is very high; but with such dosage side-effects are likely to develop.

Pædiatric Department, University Hospital, Lund, Sweden. GUNNAR ENGLESON
ORLA LEHMANN.

PILONIDAL SINUS OF THE UMBILICUS

SIR,—The accompanying figure shows a group of hairs similar to those involved in the wordy battle between Mr. Weale [1] and Mr. Patey and his colleagues.[2]

Their explanations as to how the hair gets into the sinus are most ingenious but cannot apply in the lesion from which my group is taken, as it occurred on exposed skin and with the end of the "sinus" neatly sealed off. In these "sinuses" the presence of sepsis is associated with granulation-tissue walls, whereas otherwise they are epithelialised. In fact, the lesion is virtually indistinguishable from pilonidal sinus! The diagnosis? Acne vulgaris—a comedo.



When the hair papilla descends into the dermis to link up with the capillary blood-vessels, it must presumably cease its inward journey when an adequate blood-supply has been achieved for the size of hair to be made—i.e., fine hair has shallow roots, coarser hair deeper roots. Acne vulgaris occurs under particular circumstances where there is disproportion between the depth of root and the size of hair produced, so there the similarity ends.

The fact which strikes me is that pilonidal sinus occurs at places where the skin is thick and the surface very uneven. Thus, the "downward" growth of the hair papilla in the search for a suitable capillary may, in fact, lead horizontally under existing epithelium and proceed so far that, when it does start producing hair, that hair has no chance of escaping from the neck of the hair-follicle.

Analysing the facts of Mr. Patey's report on the 26-year-old patient, I would suggest that this hair represents the undischarged produce of about six hair follicles, each producing roughly one hair every three months from puberty to his present age. They are follicles which, by growing in the wrong direction by virtue of the convolutions of the umbilicus, have proceeded too far in the wrong direction to allow egress of the hairs at their orifices.

The photograph was taken for me by the department of medical photography, St. Bartholomew's Hospital, London.

Workington, Cumberland. R. N. R. GRANT.

1. Weale, F. E. *Lancet*, 1955, i, 320; *Ibid*, Sept. 15, 1956, p. 572.
2. Patey, D. H., Scarff, R. W. *Ibid*, 1955, i, 772. Patey, D., Williams, E. S. *Ibid*, Aug. 11, 1956, p. 281.

HEADACHE AFTER SPINAL ANÆSTHESIA

SIR,—Many will disagree with the authors of the article [1] discussed in your annotation (Sept. 22) when they state that a period of recumbency after a spinal anæsthetic is not a rational practice to prevent or minimise headache. Certainly a patient who has had a spinal anæsthetic (or a lumbar puncture) should not be lost sight of too soon. I have knowledge of a patient who had a lumbar puncture carried out as an outpatient for serological purposes. Later that day, after rather a jolted drive home, he developed severe headache, and some forty-eight hours afterwards he required to be admitted to hospital—for evacuation of an intracranial subdural hæmatoma.

I have had experiences similar to that mentioned by Mr. Capener (Sept. 29). Indeed Castra Silva [2] found that the gaping hole made by a lumbar-puncture needle may be seen at laminectomy up to fifteen days after the puncture.

It is interesting that headache is not often a prominent symptom after laminectomy, even although the theca has purposely been left open. Possibly this opening is sealed off quickly as a result of the operation, or the sudden massive escape of cerebrospinal fluid at operation may so alter intracranial dynamics that different effects are produced from those sometimes seen following lumbar puncture.

Edinburgh. PHILLIP HARRIS.

INTESTINAL OBSTRUCTION BY FOOD

SIR,—In his article of Aug. 11, Mr. Thompson Rowling mentions that 5 previous cases of intestinal obstruction by food after partial gastrectomy have been reported. It is interesting to note that in the 2 additional cases described by him the obstruction was caused by undigested oranges. It has, however, escaped his attention that no less than 7 cases of intestinal obstruction due to food after partial gastrectomy have been described by me in English.[3] In 5 of these cases the obstruction was caused by citrus fruits; in the remaining 2, enterotomy had not been performed. In addition, 8 more cases of "orange obstruction" after partial gastrectomy were reported by me in Swedish this year.[4] All these 15 cases occurred in Gothenburg, a town of approximately 400,000 inhabitants.

This complication after partial gastrectomy seems to be becoming increasingly common. Patients who have been operated on for peptic ulcer should be told to chew citrus fruits carefully, or, better still, to consume the juice only.

Department of Surgery I, Sahlgrenska Sjukhuset, Gothenburg C, Sweden. P. BERTIL NORBERG.

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2. Silva, C. Cited by Koster, H., Weintrob, M. *Amer. J. Surg.* 1930, **8**, 1165.
3. *Acta chir. scand.* 1955, **109**, 43.
4. *Svenska Läkartidn.* 1956, **53**, 1575.

CALORIE INTAKE IN RELATION TO BODY-WEIGHT CHANGES

SIR,—Professor Lundbæk's letter (Sept. 29) raises a point which we have experimentally confirmed—namely, that in both growing and adult normal rats high-fat diets produce greater increases in body-weight than isocaloric high-carbohydrate diets in long-term experiments. Similar effects have been reported in hypothalamic obese rats,[1] and, in experiments of shorter duration, in hypothalamic obese mice[2] and gold-thioglucose obese mice.[3]

However, genetically obese mice exhibiting the obese hyperglycæmic syndrome showed the opposite response; much greater weight increases were caused by high-carbohydrate than by high-fat intakes.[4] Comparison of the effects of diet in different animal species and man over varying periods of time must, of course, require cautious interpretation.

Department of Medicine,
The Middlesex Hospital,
London, W.1. G. L. S. PAWAN.

INFANTILE HYPERCALCÆMIA

SIR,—The recent correspondence in your columns suggests that there is still some confusion on the rôle of vitamin D and substances passing under that name, such as calciferol. A true appreciation of the nature of this substance, often but erroneously referred to as "vitamin D," is essential to appraisal of disorders of calcium metabolism. Calciferol, or dihydro-tachysterol, is a product of the irradiation of the plant sterol, ergosterol, and so far as I know there is no evidence that it is converted in the human body into 7-dehydro-cholesterol or "animal" vitamin D.

In the dire necessity occasioned by a world war, the value of this ersatz vitamin was doubtless immeasurable; but with the return of freedom of access to abundant supplies of natural food-borne vitamins the continued nation-wide use of a substitute is less understandable, and our gratitude for its services should not blind us to the limitations inherent in its chemical nature. An instrument which has perpetuated the illusion is a Statutory Order which legitimises the use of the name vitamin D as a generic term embracing, for purposes connected with the labelling of foods, all substances possessing vitamin-D activity—a device which doubtless solves problems for the purveyor of antirachitic substances but multiplies those of the clinician. Unfortunately this terminological laxity has also pervaded our scientific literature.

In the last paragraph of their letter of Aug. 11, therefore, Dr. Forfar and his colleagues may have touched the heart of the matter more closely than they realised. The paradox may be resolved thus: calciferol, the most widely and commonly used antirachitic, is not a physiological substance; a non-physiological substance cannot be physiologically necessary; no two chemically dissimilar substances, however slight the difference between them, can possibly have identical biological effects; therefore, the lifelong taking of calciferol in food, as has widely been the case in these islands for the past seventeen years, may be expected to have pathological effects. The possibility of breakdown of calciferol into the toxic products, toxisterol and lumisterol, either in the foods containing it or in the alimentary tract, should also be taken into account. Toxisterol was mentioned by Forfar et al. (June 23) as an antirachitic, toxic, and possibly hypercalcæmic factor.

Apart from any direct effect on systemic calcium metabolism, one cannot ignore the possible modifying effects of a vitamin analogue, such as calciferol, on intestinal humoral and bacterial contents, as suggested in an earlier letter (June 30). One would presumably hesitate to infiltrate a nation's dietary with, say, a sulphonamide, knowing its action on the bacterial population of the intestines, and the resultant disturbance of the host-commensal relationship.

The significance of the symptoms (anorexia, constipation, vomiting, pallor, hypotonia, and listlessness) stated to be characteristic of infantile hypercalcæmia, is also not clear. Forfar et al. (June 23) said that symptoms and clinical progress did not vary consistently with the serum-calcium level, while the infrequent occurrence of hypercalcæmia in association with these symptoms is implicit in the letter by Dr. Colver and Professor Illingworth (July 14). In my experience, this symptom-complex has been most often associated with intoxication—by a variety of factors, ranging from cheese, bananas, and welfare "orange juice" to the toxic vapours of, among others, paint-driers, odorous antiseptics and disinfectants, and the products of combustion of fuels of all kinds. A characteristic and significant feature of these episodes has been the comparative pallor of the stools, highly suggestive of a temporary inhibition of bile-secretion. Since I postulated[1] the existence in such cases of a subclinical sensitivity of the liver to toxic factors, continued work has led me to conclude that the symptoms indicate (1) a transient exogenous toxæmia inhibiting bile-secretion, superimposed on (2) a subclinical predisposition involving insufficiency of detoxicating systems, the latter being due to (3) deficiency of natural antioxidants in food (e.g., tocopherol, vitamin E) and (4) excessive intake of the oxidation products in foods thus unprotected.

These oxidation products would include the oxidised (hydrogenated) and comparatively useless forms of the essential unsaturated fatty acids in processed milk, butter, and margarine. I have found that the essential fatty acids in the form of wheat-germ oil, are not tolerated in the active stages of most common diseases but are invaluable in the later stages of recovery, apparently conferring resistance against toxic factors such as those mentioned above and also against infections. Vitamin E, as dl-α-tocopheryl acetate, however, I constantly use to great advantage in the most severely ill patients of all ages.

Dr. Sinclair (July 14) seems to have reached similar conclusions regarding the rôle of essential fatty acids as detoxicating factors, with special reference to the detoxication of vitamin D in rats.

Dr. Hubble (July 21) considers infantile hypercalcæmia to be the result of overloading at a normally parathyroid-deficient stage of development. His argument discounting hypersensitivity to vitamin D is less acceptable, since the cases described by him as showing no intolerance to vitamin D had both recovered from infantile hypercalcæmia and might therefore have also recovered their detoxicating powers. Dr. Hubble's saturation hypothesis would explain the reported failure of additional vitamin D to affect calcium retention. This would also depend on the amount of calcium available for absorption at the time. Dr. Mitchell et al. (July 14) suggest that maximal effects may be exerted by small doses in the physiological range.

In summary, then, I would suggest that infantile hypercalcæmia is a manifestation of intoxication by substances with vitamin-D activity, occurring at a vulnerable stage of development. It is part of, and presenting with signs of, a syndrome of general insufficiency of detoxicating capacity. Investigation of the biliary and detoxication status of infants suffering from the symptom-complex of anorexia, vomiting, &c., with or without hypercalcæmia or hypercalcification, might throw further light on the ætiology of infantile hypercalcæmia.

Festiniog, Merioneth. D. MARCUS EVANS.

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2. Mayer, J., French, R. G., Zighera, C. F., Barrnett, R. J. *Ibid*, 1955, **182**, 75.
3. Marshall, N. B., Mayer, J. *Ibid*, 1954, **178**, 271.
4. Mayer, J., Jones, A. K. *Ibid*, 1953, **175**, 339. Mayer, J., Russell, R. E., Bates, M. W., Dickie, M. M. *Metabolism*, 1953, **2**, 9.

1. Evans, D. M. *Practitioner*, 1948, **160**, 306.

INTERACTION OF DEPOLARISING AND NON-DEPOLARISING RELAXANTS

SIR,—It has been generally accepted that the non-depolarising ("competitive") and depolarising relaxants antagonise the neuromuscular effects of one another.[1–3] It is also common knowledge that while anticholinesterases (e.g., neostigmine) antagonise the block produced by non-depolarising relaxants[4 5] they intensify and prolong the effects of depolarising agents.[6 7] Gradually accumulating laboratory data and clinical experience have demonstrated, however, that the interrelationship of the non-depolarising and depolarising relaxants, and the effect of anticholinesterases on these agents, is not uniform and depends on the sequence of administration and other factors.[8 9] Recently it was shown by Thesleff,[10] in single frog nerve/muscle-fibre preparations, that despite the persistence of neuromuscular block obtained by the addition of acetylcholine to the perfusate, the end-plate became repolarised within relatively short periods (10–15 minutes).

Unexpectedly increased sensitivity to *d*-tubocurarine after prolonged administration of succinylcholine observed by one of us (R. J. H. H.) seemed to be in line with the above findings. Systematic investigation of the problem revealed that doses of *d*-tubocurarine (0·15 mg. per kg.) or gallamine (0·75 mg. per kg.) which had little or no effect on the tidal exchange of anæsthetised patients invariably caused prolonged muscular relaxation and apnœa if their use was preceded by the administration of succinylcholine or of decamethonium for long periods (30 minutes or more).[11] Identical results were obtained in dogs.[12] Qualitatively similar, but quantitatively less pronounced, effects were also observed in cats.[13] The neuromuscular block thus produced could be antagonised both in man and in dogs and cats by anticholinesterases (e.g., neostigmine or edrophonium). The course of a typical case is presented in the accompanying figure.

Thesleff's findings[10] and our observations on the increase of the effects of non-depolarising relaxants after the prolonged use of depolarising agents is not inconsistent with the hypothesis that prolonged administration of depolarising drugs makes the end-plate more resistant to depolarisation. In such circumstances it is conceivable that a depolarisation block produced by succinylcholine or decamethonium may change into a non-depolarisation block. Such a change would explain the mechanism of the "mixed" or "intermediate" block of Paton and Zaimis[2 13] and also the findings that on occasion prolonged succinylcholine apnœa is reversible by neostigmine.[9]

Until the interrelations of the depolarising and non-depolarising type of muscle relaxants are better understood, the combined use of the two types of muscle relaxants should be discouraged. This applies equally to the administration of non-depolarising relaxants (e.g., *d*-tubocurarine) after long-continued administration of succinylcholine or decamethonium and to the administration of depolarising drugs (e.g., succinylcholine or decamethonium) after the use of non-depolarising agents. Prolonged apnœas have been reported under these circumstances. In view of the findings presented in this preliminary report, these disturbing complications can no longer be regarded as "unexpected."

Western Reserve University School of Medicine, Cleveland, Ohio, U.S.A. — R. J. HAMER HODGES.

Mercy Hospital, Pittsburgh, Pa., and University of Pittsburgh School of Medicine. — F. F. FOLDES.

1. DePierre, F. *C.R. Acad. Sci., Paris*, 1950, **230**, 2242.
2. Hutter, O. F., Pascoe, J. E. *Brit. J. Pharmacol.* 1951, **6**, 691.
3. Paton, W. D. M., Zaimis, E. *Pharmacol. Rev.* 1952, **4**, 219.
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5. Chase, H. F., Schmidt, J. L., Bhattakarya, B. K. *J. Pharmacol.* 1947, **91**, 236.
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7. Castillo, J. C., de Beer, E. J. *J. Pharmacol.* 1950, **99**, 458.
8. Brennan, H. J. *Brit. J. Anæsth.* 1956, **28**, 159.
9. Hodges, R. J. H. *Ibid*, 1955, **27**, 485.
10. Thesleff, S. *Nature, Lond.* 1955, **175**, 594.
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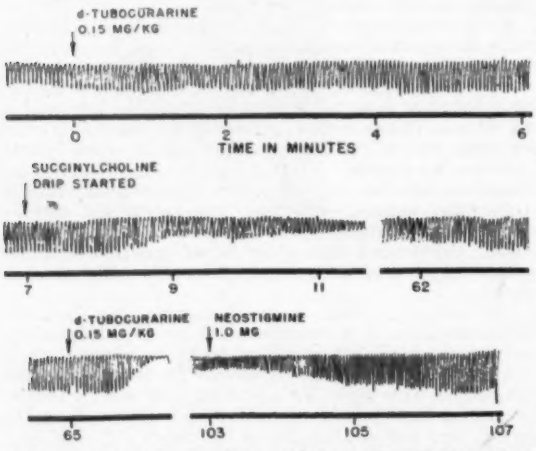

0·15 mg. per kg. *d*-tubocurarine injected at zero time. Note minimal effect on tidal volume. 436 mg. of succinylcholine was administered in continuous drip from 7 to 57 minutes. Second dose of *d*-tubocurarine was administered at 65 minutes followed by apnœa. Apnœa lasted 23 minutes. Time necessary for 20% recovery of controlled tidal volume was 34½ minutes. Neostigmine administration at 103 minutes was followed by recovery above control values in 3 minutes.

OMISSION OF PRESCRIBED P.A.S.

SIR,—I was interested to read the helpful article by Dr. Penman and Dr. Wraith (Sept. 15).

It is an alarming thought that patients may rapidly become resistant to isoniazid by omitting their *p*-aminosalicylic acid (P.A.S.) when gastric or other upsets occur, and that they might not report the fact. This is of particular significance in country areas where distance necessitates a longer interval between routine checks. It would appear that this risk could be eliminated by using a single tablet ('Dipasic') where the two drugs are present in chemical combination, in which form the P.A.S. does not appear to give side-effects. I should be glad to know whether the ferric chloride test is positive in cases where such tablets are being taken.

Rickmansworth, Herts. — B. GORDON.

*** Dr. Wraith writes: "Dr. Penman and I have found that 'Dipasic' gives a positive result to both the ferric chloride and Ehrlich's urine tests, in the same way as P.A.S."—ED. L.

MIGRAINE

SIR,—Dr. Durell (Sept. 15) and Colonel Marmion (Sept. 29) discuss the possibility that migraine attacks are associated with water retention. Undoubtedly some migraine patients do have frequency of micturition, and an increase in the urine flow, before, during, or after an attack; but this has not been evident in more than a third of the cases I have seen.

Colonel Marmion asks whether other doctors have met cases like the one he describes. I have records of over 3500 cases of migraine, and have never noted any associated cardiac failure or true œdema, though in premenstrual and menstrual migraines there may be transient generalised swelling.

The usefulness of deoxycortone in some cases may be explained on the assumption that periodic headache can be caused by localised arterial changes brought about by

13. Paton, W. D. M. *Anæsthesia*, 1953, **8**, 151.

abnormal pituitary secretion.[1] If deoxycortone acts by restoring hormonal balance this would account for the need to continue its administration indefinitely.

NEVIL LEYTON
Honorary Physician,
Migraine Clinic,
Putney Health Centre.

DESIGN OF CRASH HELMETS

SIR,—Last week's article by Commander Rawlins has been read with considerable interest. We would, however, like to emphasise that the author's criticisms are directed at a British Standard which is to be replaced in about two weeks by the revised edition which he mentions.

A subcommittee is engaged in revising two other British Standards for racing helmets—which are quite distinct in purpose and design from "protective helmets" for ordinary motor-cyclists. We think it quite wrong for Commander Rawlins to suggest, as he does, that there should be only one standard for protective helmets—i.e., the best known to science and technology. There is adequate medical and police evidence to show that the lighter type of helmet made in the past three years to B.S.2001 has unquestionably been responsible for saving many lives and averting much serious injury. It is quite certain that ordinary motor-cyclists—who in any case face much less severe hazards than their racing colleagues—would just not wear the necessarily heavier type of headgear which would give them even greater protection.

British Standards Institution,
2, Park Street, London, W.1.
S. G. WILLBY
Press officer.

DANGERS OF CORTICOTROPHIN

SIR,—Your annotation of Sept. 29 rightly calls attention to the dangers of treatment with the preparations of corticotrophin at present available. As is there pointed out, it is impossible to decide whether the ill effects sometimes seen are caused by the hormone itself or by the impurities present. But what may not at present be generally recognised is the extent to which the preparations of corticotrophin available for clinical use are contaminated with other substances.

According to present knowledge, pure corticotrophin from pig pituitary glands possesses about 100 international units per milligramme. But the preparations used clinically normally contain no more than 30 I.U. per mg. at the most and so are for the most part mixed protein-like materials from pituitary tissue. Many are much less active than this. Furthermore, cruder preparations are liable to partial inactivation at the site of injection when administered extravascularly; and, because of this, activity is often expressed in terms of a so-called "physiological unit," the determination of which is based on the results of subcutaneous injection into the animals in order that possible inactivation in vivo may at least be partially allowed for. Such a "unit" bears no fixed relation to the quantity of corticotrophin present, so that no exact equivalence can be assessed; pure pig corticotrophin might, however, be expected to possess about 300 of these "physiological units" per milligramme. A situation in which two types of unitage may be used is complicated enough, but since in most instances corticotrophin for clinical uses has been labelled not in terms of units per milligramme but only as the total number of units per vial, the extent of contamination with other substances (some of which are likely to be allergenic) may be quite unsuspected.

It is surely time that demands were made for corticotrophin that is highly purified. Until such preparations which could deserve the label "corticotrophin" by approaching 100 I.U. per mg. (or 300 physiological or proprietary units per milligramme) are made available and are adequately tested, it is premature to talk of the dangers of treatment with corticotrophin itself.

Department of Biochemistry, University of Cambridge. H. B. F. DIXON.
Department of Experimental Biochemistry, London Hospital. C. J. O. R. MORRIS.
Department of Biochemistry, University of Cambridge. F. G. YOUNG.

1. Rowbotham, G. F. *Brit. med. J.* 1946, ii, 319; 1942, ii, 685.

A FATAL CASE OF TETANUS

SIR,—Records of cases so far treated show that intermittent positive-pressure respiration in association with a relaxant drug such as suxamethonium, gallamine, or tubocurarine constitutes a distinct advance in the treatment of severe tetanus, but the favourable outcome which this line of therapy now renders possible depends also on the prevention of pulmonary complications. The case reported by Dr. Andrews and his colleagues (Sept. 29) and other cases recently reported raise several important questions:

(1) Is there any good reason for employing a potentially dangerous drug, such as chlorpromazine, when safer measures for obtaining adequate sedation are available, and were serial blood-counts carried out in the case in question?

(2) The position of the patient, when not being turned from side to side, is important; apparently tilting was not employed. Would not a semiprone (post-tonsillectomy) position with the trunk tilted downwards, say 10–15°, prove an advantage in promoting drainage of secretions and obviating the need for repeated aspiration, which in any event does not reach the smaller branches of the bronchial tree.

(3) What preparation of penicillin was used? Since this antibiotic is acknowledged to be valuable in the prevention of pulmonary complications, it is surely an advantage to use the hydriodide ester ('Estopen') which is excreted into the lung tissues in approximately four times the concentration of the ordinary crystalline salt and, by virtue of its iodide content, increases quantity and promotes liquefaction of secretions; the use of 'Alevair' or trypsin may as a result prove unnecessary.

(4) Was a filter incorporated in the apparatus to exclude germ-contaminated dust, and was the ward air and floor dust examined for the organisms found in the blood and bronchial secretions of the patient?

Royal Free Hospital,
North Western Branch,
London, N.W.3. A. MELVIN RAMSAY.

*** This letter has been shown to Dr. Andrews, whose reply follows.—ED. L.

SIR,—We are grateful to Dr. Melvin Ramsay for raising the points in his letter.

(1) As the patient was conscious and receiving paralysing doses of relaxants, we felt it was more satisfactory to use chlorpromazine rather than one of the drugs more commonly given for deep sedation.

(2) It has been our experience that patients on positive-pressure machines are difficult to nurse satisfactorily in the post-tonsillectomy position, especially if they are in the head-down position. We do not feel that this position would materially lessen the need for repeated aspiration.

(3) Crystalline penicillin was used. We feel that by giving a higher level of crystalline penicillin we can obtain a similar concentration of penicillin to that produced by 'Estopen,' without the disadvantage of the almost constant local painful reactions experienced by patients who are being given estopen. In this case, of course, the organisms isolated from the blood and sputum were insensitive to penicillin.

(4) A filter was not incorporated into the Radcliffe pump. It would be an obvious advantage, but we do not know of one in existence for this machine. A satisfactory filter of a fine enough mesh to exclude pathogenic bacteria would present great practical difficulties. However, a coarse filter would exclude many of the larger dust particles on which many of the bacteria lodge; and such a filter has in fact been incorporated into the Blease pneumoflator.

The dust was not examined for organisms. However, we feel that in cases of this type air sterilisation, such as that obtained from ultraviolet radiation, would be worth considering in the future.

Rush Green Hospital, Romford, Essex. JAMES ANDREWS.

TETANUS

SIR,—Recent articles describing the treatment of tetanus have not mentioned the importance of radiological examination of the spine after recovery. Crush fractures of the spine resulting from tetanic spasms have been recorded by, amongst others, Feistmann-Lutterbeck [1] and Dietrich et al.[2]

Recently a boy, aged 6 years, was admitted to the Derbyshire Children's Hospital ten days after a cut on the leg. "Generalised stiffness" had begun on the day of admission and severe spasms developed on the same day. As successful treatment of tetanus with chlorpromazine had been described in your columns by Dr. Kelly and Dr. Laurence,[3] a polyvinethylene catheter was inserted into the inferior vena cava via the internal saphenous vein and chlorpromazine administered by continuous drip until all spasms had disappeared. These finally ceased after eleven days. The total dose of chlorpromazine given was 1200 mg., the rate of the drip being regulated by the frequency of the patient's spasms. Otherwise general treatment was essentially similar to that outlined by Dr. Crampton Smith and his colleagues (Sept. 15). The boy made a complete clinical recovery and was soon on his feet. Nevertheless his spine was X-rayed and showed a crush fracture of the mid-dorsal vertebræ (see figure). No clinical signs of this were detectable.

Perhaps patients treated with muscle relaxants are less liable to these fractures, but radiological examination would clarify this point.

Derby. BERNARD M. LAURANCE.

ABUSE OF ANTIBIOTICS

SIR,—I was most interested to read your leading article (Aug. 11) about the spread of antibiotic-resistant bacteria, and am glad that you continue to draw attention to this most serious problem.

There is another side to the abuse of antibiotics, and that is the increasing incidence of fatal generalised infections with organisms previously practically non-pathogenic. Davis et al.[4] have described a fatal case of monilial septicæmia following the routine prophylactic administration of penicillin and streptomycin to infants born by cæsarean section at a maternity unit in the U.S.A. The American literature contains many references to fatal cases of moniliasis after antibiotics. I have myself had a fatal case of proteus septicæmia following treatment with antibiotics for a chronic urinary infection.

Surely it is time that the routine prophylactic use of antibiotics was discontinued and that they were reserved for cases of infection where there is real indication, and not just given indiscriminately for every illness. If the infection will respond to some safer measure—e.g., hexamine mandelate or sulphonamides for cystitis—this should be tried first.

Hove, Sussex. S. H. C. CLARKE.

OPERATING-THEATRE STERILISERS

SIR,—Professor Howie and Dr. Timbury (Sept. 29) amplify Dr. J. H. Bowie's statement that "the heart of a dressing steriliser is the steam-trap on the automatic air and condensate chamber discharge channel," pointing out that these should be of a type "set to open automatically at 2°F below the condensate temperature of pure steam" and not, as normally fitted, to operate at a difference of 5, 15, or 20°F.

In 1942 I wrote a book (*Steam Trapping and Air Venting*) in which, discussing the correct fittings for sterilisers, I pointed out that these should have near-to-steam elements. For a while such steam-traps were made, and they were discontinued only because it is impossible by visual examination to tell the difference between the discharge of an air/steam mixture and the discharge of pure steam, so that hospital engineers often gathered the erroneous impression that such steam-traps were wasting steam.

I am glad to report that steam-traps with near-to-steam elements are once again available for use on sterilisers, and am quite sure that they will go a long way towards overcoming some at least of the difficulties uncovered by Professor Howie in his series of laboratory tests.

Cheltenham. L. G. NORTHCROFT.

SIR,—In their interesting article Professor Howie and Dr. Timbury do not consider the use of hot-air sterilisers, on which I have worked with Dr. Darmady.[1] In my investigation of steam sterilisers—which ought, I think, to be clearly distinguished by referring to them always as autoclaves—further problems have arisen, and I was particularly pleased to note Professor Howie's emphasis on troubles arising from hospital air. Under hospital conditions the practice of drying dressings in autoclaves, by opening the lid and keeping a hot jacket going to stimulate air circulation and drying, is absurd. If drying of this type is wanted, the only practical method is to pump in sterile hot air for drying, in which case the jacket is unnecessary. If one is relying on a vacuum for drying, then again the jacket should not be needed.

Underwood [2] has clearly exposed the common fallacy that a vacuum is of any value in removing air. Given an outlet for air and condensate in the proper place, there is no object in having a vacuum: it adds a dangerous complication without any compensating advantage.

I may add that though better and better types of autoclave will certainly be developed, some of those already available are capable of giving completely satisfactory results, without many of the complications previously thought necessary.

Townson & Mercer Ltd., Beddington Lane, Croydon, Surrey. R. BARRINGTON BROCK Director.

1. Darmady, E. M., Brock, R. B. Temperature Levels in Hot-air Ovens. *J. clin. Path.* 1954, **7**, 290.
2. Underwood, W. Textbook on Sterilisation.

1. Feistmann-Lutterbeck, E. *Acta radiol., Stockh.* 1938, **19**, 391.
2. Dietrich, H. F., Karshner, R. G., Stewart, S. F. *J. Bone Jt Surg.* 1940, **22**, 43.
3. Kelly, R. E., Laurence, D. R. *Lancet*, 1956, **I**, 118.
4. Davis, J. B., Whitaker, J. D., Ding, L. K., Kiefer, J. H. *J. Urol.* 1956, **75**, 930.

Births, Marriages, and Deaths

BIRTHS

CRAIG.—On Oct. 2, at Southmead Hospital, Bristol, to Jean (née Simpson), wife of Dr. R. A. Craig—a daughter.

JONES.—On Oct. 6, at University College Hospital, London, to Monica (née Cogman), M.B., wife of Peter H. Jones, M.V.O., F.R.C.S.—a son.

WEST.—On Sept. 27, at the General Hospital, Sault Ste. Marie, Ontario, Canada, to Kathleen (née Stanhope), wife of Michael H West, M.D., M.R.C.P., of 125, Simpson Street, Sault Ste. Marie—a daughter.

Notes and News

POLIOMYELITIS VACCINE

Dr. A. B. Sabin, of Cincinnati, has announced his readiness to undertake large-scale trials of vaccination with orally administered attenuated poliomyelitis virus.[1] Dr. Sabin claimed that a single dose would produce lengthy—perhaps life-long—immunity against all three major strains of the virus. Tests in animals and man had proved the safety of the vaccine, which was now ready for mass testing on an international basis. Vaccinated animals had become highly resistant to poliomyelitis infection. Dr. Sabin is quoted as saying: "I believe the strains we now have represent pure populations derived from single-virus particles specially tested and selected because of their inability to produce paralysis following inoculation of very large doses of inspected particles into the most sensitive nerve cells." But Dr. Sabin added that for the present the Salk vaccine was the only proved protector against poliomyelitis in man.

SCOTLAND'S MENTAL HOSPITALS

OF over 60,000 staffed hospital beds in Scotland, more than 25,000 are occupied by the mentally ill or mentally deficient. These figures were cited by Mr. J. Nixon Browne, joint parliamentary under-secretary of State for Scotland, on Oct. 3 at the end of a tour of hospitals. Of the country's 29 mental hospitals, only 1, he said, had been built in the past fifty years; but now large sums of money were being put into such hospitals. Conditions for the patient were generally better than the average person would suppose; but there was still a lot of old furniture and chocolate-brown wards, and some hospitals were overcrowded. In some, too, there was need for a driving force to get games and social activities organised. Mr. Nixon Browne said that he would like all mental hospitals to follow the example of those which had introduced choice of dishes for patients, and also of those which had a complaints system.

BOXING

IN its annual report, the London Amateur Boxing Association defends boxing against recent attacks made on it—notably by Dr. Edith Summerskill in her book *The Ignoble Art*. In a statement by its honorary medical officers, Dr. J. L. Blonstein and Dr. J. Sharp-Grant, the association contends that the benefits of boxing to boys' health are both psychological and physical. "Psychologically boxing benefits inadequate, insecure, or aggressive boys alike, affording both the opportunity to develop discipline and the art of self-defence. The physical training and roadwork . . . and the moderation needed in smoking and drinking, lead to physical fitness and good health." The association insists on stringent precautions to ensure that boys are fit to box; and, the report goes on, records for the 1955–56 season show that the few boxers who might have suffered possible head injuries had normal electroencephalograms. The association claims that despite the thousands of contests which take place, there are very few serious injuries—"far fewer, proportionately, than in football of either code or in athletics."

NAME AND ADDRESS

WE must remind anonymous contributors, including "Junior Registrar," that their communications cannot even be considered for publication unless they give us their name and address.

Royal College of Surgeons of England

The programme of meetings to be held at the college, Lincoln's Inn Fields, London, W.C.2, on Wednesday, Dec. 12, will include scientific films and exhibits at 10 A.M. and an exhibition of work in the college departments at 11.30 A.M. At 2.30 P.M. Dr. I. S. Ravdin, chairman of the board of regents of the American College of Surgeons, will give the Moynihan lecture. At 4 P.M. there will be the annual general meeting, for fellows and members only.

Fellowship for Freedom in Medicine

The annual general meeting of the Fellowship will be held at Caxton Hall, Westminster, S.W.1, on Saturday, Nov. 10, at 2 P.M.

1. *Times*, Oct. 8, 1956; *Manchester Guardian*, Oct. 9, 1956.

Royal College of Physicians of London

Dr. William Phillips will deliver the Bradshaw lecture on Thursday, Nov. 8, on the disintegrative action of the nervous system. On Tuesday, Nov. 20, Sir Maurice Bowra, D.LITT, will give the Lloyd-Roberts lecture. His subject is to be Greek Science—its Greatness and its Failure. On Tuesday and Thursday, Dec. 11 and 13, Dr. Terence East will deliver the FitzPatrick lectures, on the history of cardiology. All the lectures will be held at the college, Pall Mall East, S.W.1, at 5 P.M.

Royal Faculty of Physicians and Surgeons of Glasgow

At a meeting of the faculty on Oct. 1, with Prof. Stanley Graham, the president, in the chair, William Donald Graham and Gerald Charles Timbury were admitted to the fellowship.

It was announced that the Wellcome Trust had agreed to give £500 per annum for five years for repairing the historical section of the library.

The library, instituted in 1697, consists of some 150,000 volumes, more than 4000 of which were published before 1700. Many of these are of extreme rarity and some are unique.

University College Hospital

The annual dinner of past and present students of U.C.H. Medical School will be held at the Savoy Hotel, Strand, London, W.C.2, on Friday, Oct. 19, at 8 P.M. Mr. Leslie Williams will be in the chair. Tickets (32*s*. 6*d*.) may be had from the hon. secretary of the Old Students' Association, University College Hospital Medical School, University Street, W.C.1.

Sydney Body Lecture

On Friday, Oct. 19, at 8.30 P.M., at the General Hospital, Southend, Mr. Aleck Bourne will receive the Sydney Body medal for his service to the hospital and will afterwards deliver this lecture. He is to speak on Women as Patients.

Long Fox Lecture

Dr. A. M. Maclachlan will deliver this lecture, at the Wills Physics Building of the University of Bristol (Royal Fort), at 8.15 P.M. on Tuesday, Oct. 16. He is to speak on his visit to the U.S.S.R. this year.

Marlborough Day Hospital

Open lectures on mental health are held at this hospital, 38, Marlborough Place, London, N.W.8, on the first Monday of every month at 8.15 P.M. Dr. Otho FitzGerald will give the first lecture of the new term on Nov. 5, on mental-hospital administration.

British Society for Immunology

The first meeting of this society will be held at the Wellcome Foundation, 183, Euston Road, London, N.W.1, beginning at 10 A.M. on Friday, Nov. 9, and continuing on Saturday. Particulars may be had from Prof. G. Payling Wright, Department of Pathology, Guy's Hospital Medical School, London, S.E.1.

Manchester Northern Hospital

This year this hospital is celebrating its centenary. To commemorate the occasion verandahs on two of the wards have been converted into day-rooms, which were officially opened by the Earl of Derby on Oct. 9. The hospital committee have published a booklet which briefly describes the history and work of the hospital.

British Schools Exploring Society

Applications are invited for the posts of an honorary physician and an honorary surgeon for the 1957 expedition of this society to Northern Norway or Finnish Lapland, leaving about July 28 and returning in mid-September. Applicants should write as soon as possible to the secretary of the society, 2/W Artillery Mansions, 75, Victoria Street, London, S.W.1.

Ophthalmological Society of the United Kingdom

Next year the annual congress of this society will be held at 1, Wimpole Street, London, W.1, on April 11, 12, and 13. Mr. J. J. Healy will deliver the presidential address on the intra-ocular circulation in arteriosclerosis and high blood-pressure, and Sir Stewart Duke-Elder the Bowman lecture on the ætiology of glaucoma. Prof. G. I. Scott, Dr. Norman Ashton, and Dr. J. D. N. Nabarro will open a discussion on ocular aspects of diabetes. Further particulars may be had from Mr. J. R. Hudson, the congress secretary, 45, Lincoln's Inn Fields, W.C.2.

Alex Simpson Smith Lecture

Dr. T. Cecil Gray will deliver this lecture on Tuesday, Oct. 30, at 5.15 P.M., at West London Hospital, W.6. He is to speak on circulatory control.

Children and the Law

The members of the departmental committee set up last June under the chairmanship of Lord Ingleby to inquire into the law relating to children and young people include Dr. Denis Carroll and Prof. Alan Moncrieff.

French Scientific Films

The programme to be given at the Institut Français, Queensberry Place, London, S.W.7, on Wednesday, Oct. 24, at 8.15 P.M. will include a film on œsophagoscopy.

Sigerist Society

On Friday, Oct. 26, at 8 P.M., at the Imperial Hotel, Russell Square, London, W.C.1, Dr. A. McPherson and Dr. B. McPherson will describe their visit to China this summer as guests of the Chinese Medical Association.

Draft Standard for Contraceptives

The British Standards Institution has published a draft standard for rubber condoms, washable sheaths, and diaphragms. Comments on this draft (CW [SGC] 7820) should be sent by Nov. 16 to the Institution, 2, Park Street, London, W.1.

Mr. John Cronin, F.R.C.S., M.P., has left for Malta, where he is to advise the government in the reorganisation of the Maltese medical services.

Diary of the Week

OCT. 14 TO 20

Monday, 15th

POSTGRADUATE MEDICAL SCHOOL OF LONDON, Ducane Road, W.12
4 P.M. Dr. Ian Gilliland: Exophthalmos.

HUNTERIAN SOCIETY
8.30 P.M. (Talbot Restaurant, 64, London Wall, E.C.2.) Dr. C. D. Coyle: The Changing Hospital. (Presidential address.)

MARLBOROUGH DAY HOSPITAL, 38, Marlborough Place, London, N.W.8
8.15 P.M. Dr. J. L. Moreno: Psychodrama and Sociometry.

Tuesday, 16th

ROYAL SOCIETY OF MEDICINE, 1, Wimpole Street, W.1
8 P.M. *Pathology.* Prof. J. W. S. Blacklock: Injury as a Factor in Tuberculosis. (Presidential address.)

ST. MARY'S HOSPITAL MEDICAL SCHOOL, Paddington, W.2
5 P.M. Dr. Jack Suchot: Appraisal of the Results of Treatment of Infertility.

BRITISH POSTGRADUATE MEDICAL FEDERATION
5.30 P.M. (London School of Hygiene and Tropical Medicine, Keppel Street, W.C.1.) Mr. K. M. Smith, D.SC., F.R.S.: Electron Microscope in the Study of Viruses.

MANCHESTER MEDICAL SOCIETY
4.30 P.M. (Clinical Sciences Building, York Place, Manchester, 13.) Dr. H. R. Bierman (California): The Leukæmias—Proliferative or Accumulative Disease?

Wednesday, 17th

ROYAL SOCIETY OF MEDICINE
5 P.M. *Comparative Medicine.* Dr. Douglas McClean: The Scientist as Citizen. (Presidential address.)
8.15 P.M. *General Practice.* Dr. G. O. Barber: Paediatrics in General Practice. (Valedictory address.)

POSTGRADUATE MEDICAL SCHOOL OF LONDON
2 P.M. Prof. A. Neuberger, F.R.S.: Proteins of Connective Tissue.

ROYAL INSTITUTE OF PUBLIC HEALTH AND HYGIENE, 28, Portland Place, W.1
3 P.M. Dr. P. M. F. Bishop: Problem of Obesity. (Bengué lecture.)

INSTITUTE OF DISEASES OF THE CHEST, Brompton, S.W.3
5 P.M. Dr. R. W. Riddell: Fungus Infections of the Lung.

INSTITUTE OF DERMATOLOGY, Lisle Street, London, W.C.2
5.30 P.M. Dr. J. S. Pegum: Hair Growth.

BRITISH ASSOCIATION OF SPORT AND MEDICINE
5.30 P.M. (Charing Cross Hospital Medical School, W.C.2.) Mr. K. S. Duncan: A Layman Looks at Athletics.

ROYAL MICROSCOPICAL SOCIETY, Tavistock House South, W.C.1
5.30 P.M. Dr. Robert Barer: Quantitative Microscopy.

EUGENICS SOCIETY
5.30 P.M. (Burlington House, Piccadilly, W.1.) Dr. Margaret Jackson, Dr. Philip Bloom, Dr. C. P. Blacker, Mr. A. S. Parkes, D.SC., F.R.S., Mr. Cecil Binney: Artificial Insemination.

ROYAL COLLEGE OF SURGEONS OF EDINBURGH, Edinburgh, 8
3.30 P.M. Prof. C. A. Wells: Conservation of Renal Function.

Thursday, 18th

ROYAL COLLEGE OF PHYSICIANS OF LONDON, Pall Mall East, S.W.1
3 P.M. Prof. J. Crighton Bramwell: Practice, Teaching, and Research. (Harveian oration.)

ROYAL SOCIETY OF MEDICINE
8.30 P.M. *Orthopædics and Physical Medicine.* Sir Reginald Watson-Jones, Dr. Guy Beauchamp, Dr. Hugh Burt, Dr. A. T. Richardson: Manipulative Treatment.

BRITISH POSTGRADUATE MEDICAL FEDERATION
5.30 P.M. (London School of Hygiene and Tropical Medicine.) Dr. F. H. C. Crick: Structure and Function of Smal Viruses.

ROYAL EYE HOSPITAL, St. George's Circus, London, S.E.1
5.15 P.M. Dr. T. H. Whittington: Formation of Images.

LONDON JEWISH HOSPITAL MEDICAL SOCIETY
8.30 P.M. (11, Chandos Street, W.1.) Dr. Isaac Gordon: Hazards of Drug Therapy.

HYPNOTHERAPY GROUP
8 P.M. (1, Wimpole Street, W.1.) Dr. William Moodie: Planned Research in the Future of Hypnotherapy.

BRITISH INSTITUTE OF RADIOLOGY, 32, Welbeck Street, W.1
8 P.M. Dr. R. I. Roberts: Mechanism of Pharyngeal Deglutition in the Normal. Dr. G. M. Ardran: Swallowing Defects After Poliomyelitis.

NUFFIELD ORTHOPÆDIC CENTRE, Wingfield-Morris Orthopædic Hospital, Oxford
8.30 P.M. Prof. Joseph Trueta: Ætiopathology of Perthes's Disease.

LIVERPOOL MEDICAL INSTITUTION, 114, Mount Pleasant, Liverpool, 3
8 P.M. Dr. W. Howel Evans: Tylosis and Œsophageal Cancer. Dr. A. H. Cruickshank: Diagnostic Difficulties in Buccal and Faucial Biopsy.

MANCHESTER MEDICAL SOCIETY
8 P.M. *Anæsthetics.* Dr. W. B. Bacon: Movement in Anæsthesia. (Presidential address.)

ST. ANDREW'S UNIVERSITY, Queen's College, Small's Wynd, Dundee
5 P.M. Prof. Dorothy Russell: Hormonal Activities of the Pituitary in Relation to its Cytology.

Friday, 19th

ROYAL SOCIETY OF MEDICINE
5 P.M. *Epidemiology and Preventive Medicine.* Dr. Ian Taylor: Changing Epidemiology of Sonne Dysentery. (Presidential address.)

POSTGRADUATE MEDICAL SCHOOL OF LONDON
10 A.M. Mr. John Hosford: Biliary Surgery.
4 P.M. Sir Stanley Davidson: Blood Diseases.

INSTITUTE OF DERMATOLOGY
5.30 P.M. Dr. R. T. Brain: Skin Diseases in Children.

INSTITUTE OF OBSTETRICS AND GYNÆCOLOGY
3 P.M. (Hammersmith Hospital, London, W.12.) Mr. D. M. Stern: Pre-eclamptic Toxæmia.

BRITISH ASSOCIATION OF ALLERGISTS
6.10 P.M. (Institute of Diseases of the Chest.) Dr. Nine Choucroun (Paris): Antigenic Components of the Tubercle Bacillus in Relation to Tuberculin Hypersensitivity and Immunity. Dr. D. Geraint James: Skin-test Reactions to Tuberculo-lipopolysaccharide in Patients with Sarcoidosis and Tuberculosis. Dr. Jack Pepys: Anaphylactic Aspects of Tuberculin Hypersensitivity. Dr. J. Colover: The Rôle of the Tubercle Bacillus in the Experimental Study of Allergic Lesions in the Central Nervous System.

ROYAL MEDICO-CHIRURGICAL SOCIETY OF GLASGOW
8.30 P.M. (Royal Faculty of Physicians and Surgeons, 242, St. Vincent Street, Glasgow, C.2.) *Joint Meeting with the Edinburgh Medico-Chirurgical Society.* Mr. K. P. Brown, Dr. James Kennedy, Mr. F. H. Roberts: Abdominal Emergencies.

Appointments

DOBSON, J. N., M.B. Edin., D.P.H.: M.O.H., Whitehaven and Ennerdale, and assistant M.O., Cumberland.

KEIDAN, SIMEON, M.B. Leeds: whole-time assistant chest physician, Pontllanfraith chest clinic, Monmouthshire.

LYNAM, G. F., M.B. N.U.I., D.A.: whole-time assistant anæsthetist, Grimsby and Louth.

REGESTER, P. T., M.R.C.S., D.P.H.: assistant M.O. and school M.O., Cumberland.

ROBERTS, G. A., M.B. Lond., D.P.H.: assistant M.O., Luton.

SHERRATT, T. W., M.R.C.S., L.D.S.: assistant M.O.H. and assistant school M.O., Oldham.

TAPP, GWENDOLYN R., M.R.C.S., D.C.H.: assistant M.O., Luton.

WESTCOMBE, PETER, M.B. Lond., D.P.H.: deputy divisional M.O. and assistant M.O., southern health division, Surrey, and deputy M.O.H., Reigate and Godstone R.D.S.

YOUNG, ENID M., M.B. Durh.: school M.O., Northumberland.

Manchester Regional Hospital Board:

BEETLES, E. A., M.B. Madras, D.M.R.D.: consultant radiologist, Blackburn and district group of hospitals.

DOWNHAM, E. T., M.D. Lpool, D.P.M.: consultant psychiatrist, Burnley and district group of hospitals and Whittingham Hospital, Preston.

MORRIS, MADELEINE B., M.D. Lond., M.R.C.P., D.C.H.: consultant pædiatrician, Barrow and Furness group of hospitals.

ROBINSON, A. F., M.B. Manc., F.R.C.S.: consultant surgeon, Burnley and district group of hospitals.

South-Western Regional Hospital Board:

BURNS, MARGARET E., M.B. Birm., D.C.H., D.A.: anæsthetic registrar, Southmead Hospital, Bristol.

DOWNING, W. B. L., M.B. Birm., F.R.C.S.E., D.L.O.: consultant E.N.T. surgeon, north Gloucestershire clinical area.

PELMORE, J. F., M.R.C.S., D.A.: consultant anæsthetist, Bristol clinical area.

The Hospital for Sick Children, Great Ormond Street, London:

ASHFORTH, MARION M., M.B. Lond., D.C.H.: resident officer, department of neurology and neurosurgery.

COX, M. J., M.B. Lond.: house-surgeon, orthopædic and plastic departments.

NIXON, K. H., M.B. Lond.: registrar, department of physical medicine.

WESTON, H. J., M.B. N.Z., M.R.C.P.: house-physician.

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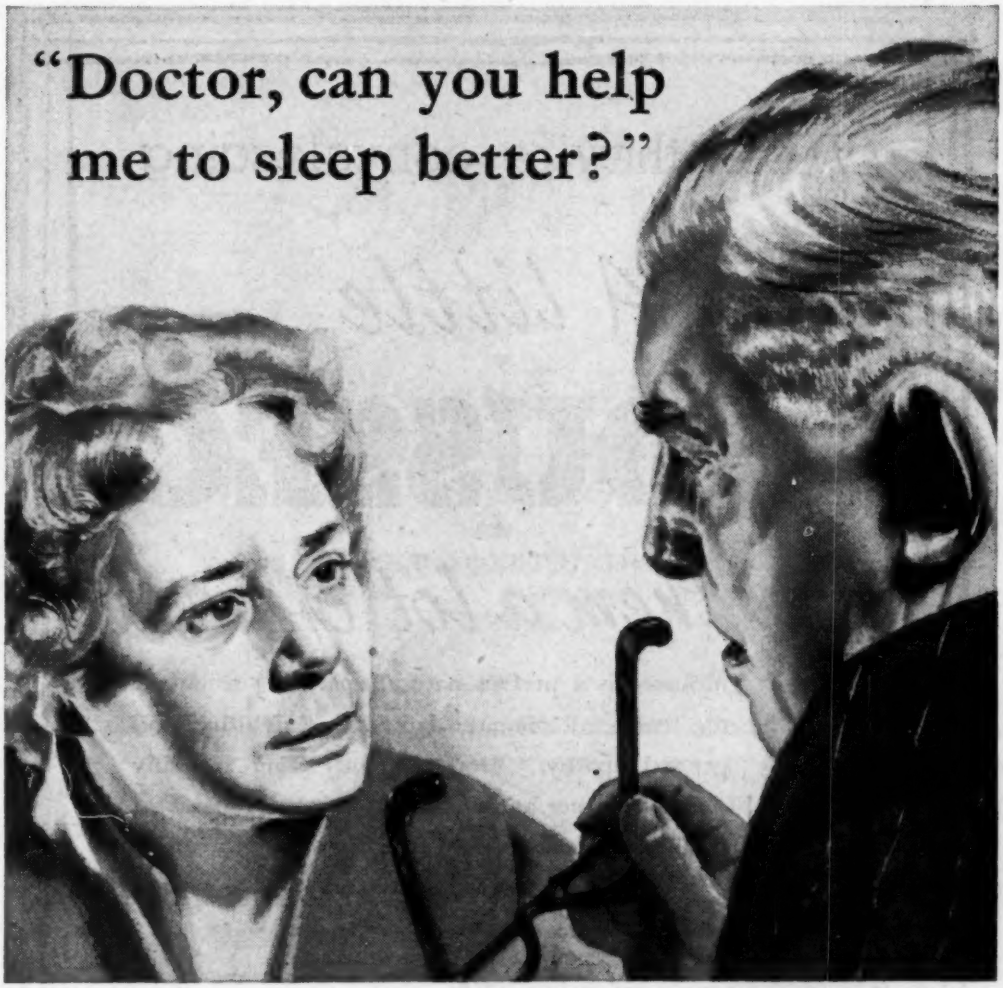

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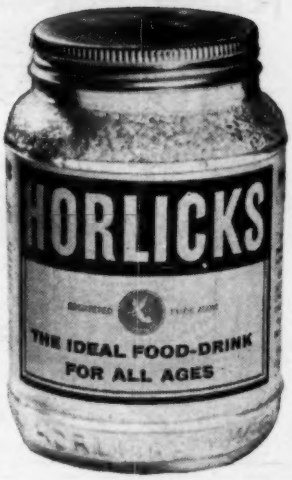

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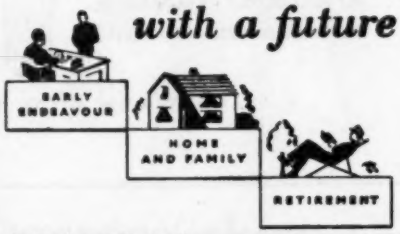

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Academic and Educational

ROYAL COLLEGE OF SURGEONS OF ENGLAND

COURT OF EXAMINERS

Notice is hereby given that the Council, on 8TH NOVEMBER, 1956, will elect 3 Members of the Court of Examiners, 2 to examine in Ophthalmology and 1 in Otolaryngology. Of the Examiners retiring in rotation, Mr. A. McKie Reid (Ophthalmology) does not seek re-election, and Mr. J. H. Doggart (Ophthalmology) and Mr. R. J. Cann (Otolaryngology) are seeking re-election.

Fellows of the College desirous of becoming candidates for the Office must make application, in writing, to the Secretary on or before 31st October, 1956.

KENNEDY CASSELS, Secretary.

Lincoln's Inn-fields, London, W.C.2.

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of the
ROYAL COLLEGE OF SURGEONS OF ENGLAND

THE FREDERIC HEWITT LECTURE will be delivered by Dr. R. F. WOOLMER, F.F.A.R.C.S., on "Artistry and Science in Anæsthesia," at 4 P.M., on THURSDAY, 1ST NOVEMBER, 1956.

Medical Practitioners, Dental Surgeons and Advanced Students are eligible to attend.

October, 1956. W. F. DAVIS, Secretary.

THE LONDON HOSPITAL MEDICAL COLLEGE

COURSE IN ADVANCED MEDICINE

A Postgraduate Course in Medicine will be held at The London Hospital commencing MONDAY, 7TH JANUARY, and finishing FRIDAY, 15TH MARCH, 1957. Classes will be held on Mondays, Wednesdays and Fridays. The course will be limited to 24 students.

Applications should be made to the Dean. The fee for the whole course will be 35 guineas, and for Old Londoners 15 guineas.

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AN INTENSIVE COURSE, suitable for Postgraduates preparing for higher examinations (M.R.C.O.G. and M.D.) is being held from 3RD DECEMBER to 15TH DECEMBER, 1956, at Queen Charlotte's Maternity Hospital, the Chelsea Hospital for Women and the Department of Obstetrics and Gynæcology at Hammersmith Hospital.

The fee for the Course is £14 14s. (14 guineas).

Applications should be sent to the Secretary, Institute of Obstetrics and Gynæcology at Chelsea Hospital for Women, Dovehouse-street, London, S.W.3.

THE HEBERDEN SOCIETY

ON FRIDAY, 19TH OCTOBER, 1956, at 8.30 P.M., Dr. WALTER BAUER, F.A.C.P., will deliver the HEBERDEN ORATION FOR 1955 at The Royal Society of Medicine, London, W.1. He is to speak on "Research and the Rheumatic Diseases."

Members of the medical profession are cordially invited to attend.

THE ROYAL SOCIETY

GOVERNMENT GRANT FOR SCIENTIFIC INVESTIGATIONS

Applications for grants from the third allotment of the Government Grant for Scientific Investigations for the year 1956 should be made as soon as possible on forms of application to be obtained from the Assistant Secretary of the Royal Society, Burlington House, London, W.1. No application can be considered which is received later than 20TH NOVEMBER, 1956.

Applicants must be of British nationality, resident in Great Britain or Northern Ireland. Grants may be made for purposes in connection with the promotion and support of research in pure science other than for personal maintenance or payment of stipends; for the assistance of scientific expeditions and collections; but not in aid of scientific publications.

L.M.S.S.A.

FINAL EXAMINATION: SURGERY, 12th November, 3rd December, 1956, 14th January, 1957. MEDICINE, PATHOLOGY, 19th November, 10th December, 1956, 21st January, 1957. MIDWIFERY, 20th November, 11th December, 1956, 22nd January, 1957. MASTERY OF MIDWIFERY, May and November. DIPLOMA IN INDUSTRIAL HEALTH, July and December.

For regulations apply REGISTRAR, Apothecaries Hall, Black Friars-lane, London, E.C.4.

MIDDLESEX HOSPITAL, W.1. Applications are invited for the post of ASSISTANT to the Department of Surgical Studies, vacant 1st January, 1957. Commencing salary within the range of £1000–£1300 p.a. according to age and experience.

Applications, stating age, qualifications, &c., and nominating 3 referees, should reach the Secretary of the Medical School by Wednesday, 31st October, 1956.

THE UNIVERSITY OF LIVERPOOL. Applications are invited from medically qualified candidates for the post of LECTURER in the Department of Public Health. The salary scale will be £1000–£100–£1700–£50–£1750 p.a. The initial salary will be within the range £1000–£1400 p.a., according to qualifications and experience. Arrangements will also be made for the successful candidate to be appointed Honorary Assistant Medical Officer of Health in the City of Liverpool Public Health Department, ensuring wide scope for practical work in the field of public health.

Applications, stating age, qualifications and experience, together with the names of 3 referees, should be received not later than 3rd November, 1956, by the undersigned, from whom further particulars of the conditions of appointment may be obtained. STANLEY DUMBELL, Registrar.

UNIVERSITY OF ABERDEEN. Applications are invited for the post of LECTURER IN SURGERY. Initial salary on scales rising to £1500, with placing according to qualifications and experience. F.S.S.U. and children's allowance. Proportion of removal expenses refunded. The Lecturer will be accorded clinical status on the staffs of the Aberdeen teaching hospitals.

Conditions of appointment and forms of application should be obtained from the Secretary, The University, Aberdeen, with whom applications (12 copies) should be lodged not later than 1st November, 1956. Applicants outside the British Isles may submit 1 copy of application.

UNIVERSITY OF BRISTOL. Applications are invited for the appointment of LECTURER IN ANÆSTHETICS in the University, tenable in the United Bristol Hospitals. Salary within the scale for Clinical Lecturers, together with superannuation and children's allowances. The successful candidate will be granted an honorary contract as Consultant with the Board of Governors of the United Bristol Hospitals.

Applications (20 copies), stating age, qualifications and experience and including the names of 3 referees, should reach the undersigned, from whom further particulars may be obtained, not later than 10th November, 1956.

H. C. BUTTERFIELD, Registrar and Secretary.

THE WELSH NATIONAL SCHOOL OF MEDICINE. (UNIVERSITY OF WALES.) Applications are invited for the post of SENIOR LECTURER in the Department of Obstetrics and Gynæcology of The Welsh National School of Medicine. The person appointed will be required to assist in the work of the Professorial Department as directed by the Professor, and in the care of patients at the Cardiff Royal Infirmary and other hospitals. The post is full-time with salary on the scale £1750–£100–£2400 p.a. Schemes of superannuation and family allowances apply to the appointment.

Further particulars may be obtained from the undersigned, by whom applications should be received within 3 weeks of the appearance of this advertisement.

34, Newport-road, Cardiff. F. DODSWORTH, Secretary.

AUSTRALIA. UNIVERSITY OF SYDNEY. Applications are invited for the positions of LECTURER and SENIOR LECTURER IN SURGERY. The salary for a Lecturer is within the range of £A1200–£A80–£A1750 p.a.; for a Senior Lecturer £A1800–£A70–£A2150 p.a. In each case cost-of-living adjustment will be allowed £A52 men, £A39 women. The salaries are subject to deductions under the State Superannuation Act. The appointments will be full-time and the commencing salaries will be fixed according to the qualifications and experience of the successful applicants. Finance available for home purchase to married male members of staff.

Further particulars and information as to the method of application may be obtained from the Secretary, Association of Universities of the British Commonwealth, 36, Gordon-square, London, W.C.1. The closing date for the receipt of applications, in Australia and London, is 30th November, 1956.

Hospital Services: Senior Appointments

QUEEN CHARLOTTE'S AND CHELSEA HOSPITALS. Applications are invited from suitably qualified registered medical practitioners for the appointment of PSYCHIATRIST (Consultant status) on the basis of 2 notional half-day sessions per week, for sessional duties at Chelsea Hospital for Women and emergency duties at Queen Charlotte's Maternity Hospital. The present honorary officer will be a candidate for this appointment.

Applications, with the names of 3 referees, should reach the Secretary to the Board of Governors, 339, Goldhawk-road, London, W.6, by 23rd November, 1956.

ST. GEORGE'S HOSPITAL, S.W.1. Applications are invited for a CONSULTANT post in Neurosurgery. The work will be chiefly at the Atkinson Morley Hospital, Wimbledon, in the Neurosurgical Department of St. George's Hospital. Candidates must be Fellows of the Royal College of Surgeons (England). The appointment will be for 7 notional half-days per week, and remuneration and conditions of service will be those applicable to part-time Consultant staff under the National Health Service. The successful candidate will be required to take up duty as soon as possible after 1st January, 1957.

Applications, stating age, education, qualifications and experience, together with the names and addresses of 3 referees, should reach the undersigned not later than 10th November, 1956. P. H. CONSTABLE, House Governor.

ST. PETER'S, ST. PAUL'S AND ST. PHILIP'S HOS-PITALS, Henrietta-street, W.C.2. Applications are invited for the post of Whole-time ASSISTANT PATHOLOGIST (Senior Hospital Medical Officer). Good general training and special experience in bacteriology and serology essential. Opportunities for research. Laboratory at St. Paul's may be visited by appointment.

Applications (9 copies), stating age, qualifications and experience, and enclosing the names of 3 referees, to the House Governor by 3rd November, 1956.

BIRMINGHAM REGIONAL HOSPITAL BOARD. Part-time CONSULTANT DERMATOLOGIST (9 notional half-days weekly). Duties at hospitals in Coventry and South Warwickshire Groups. Wide experience specialty and higher medical qualification essential.

Applications (15 copies), stating name, age, nationality, qualifications and naming 3 referees, to Secretary, 10, Augustus-road, Birmingham, 15, by 29th October, 1956.

LEEDS REGIONAL HOSPITAL BOARD. Whole-time Locum SENIOR HOSPITAL MEDICAL OFFICER in Psychiatry required for duties at Broadgate Hospital, Beverley, for November and December, 1956.

Applications, stating age, qualifications and details of appointments held showing dates, together with the names and addresses of 3 referees, to the Secretary, Park-parade, Harrogate, as soon as possible.

CARDIFF. THE UNITED CARDIFF HOSPITALS. (Joint appointment with Welsh Regional Hospital Board.) The Board of Governors of the United Cardiff Hospitals and the Welsh Regional Hospital Board invite applications from suitably qualified medical practitioners for the post of CONSULTANT ANÆSTHETIST (full-time or maximum part-time). The successful candidate will work mainly in the United Cardiff Hospitals.

Applications, with the names of 3 referees, should be sent to the Secretary to the Board, United Cardiff Hospitals, Cardiff Royal Infirmary, Cardiff, not later than 27th October, 1956.

LEEDS REGIONAL HOSPITAL BOARD.

Whole-time CONSULTANT PSYCHIATRIST AND PHYSICIAN-SUPERINTENDENT, Menston Hospital, near Leeds (2500 Beds). The duties of the appointment will also include attendances at the Bradford Royal Infirmary and such other extramural duties as may be required at associated general hospitals. Candidates should hold high qualifications in medicine and psychiatry and have had experience of administrative aspects of the specialty. A modern house is available in the Hospital grounds.

Whole-time ASSISTANT RADIOLOGIST (Senior Hospital Medical Officer scale) for duties at hospitals in the Hull A, Hull B and East Riding Hospital Management Committee Groups. Applicants should have had wide experience in radiology and the possession of the D.M.R. is essential. The successful candidate will work under the general guidance of the Consultant in charge of the department and will be required to reside in or near Hull.

Part-time (8 notional half-days per week) ASSISTANT OPHTHALMOLOGIST (Senior Hospital Medical Officer scale) for duties at the Royal Eye and Ear Hospital, Bradford, and the Bradford, Dewsbury and West Riding County Council School Clinics; the person appointed to reside in Bradford.

Whole-time ASSISTANT PSYCHIATRIST (Senior Hospital Medical Officer scale) for duties at Storthes Hall Hospital (2680 Beds), Kirkburton, near Huddersfield, and associated clinics at general hospitals. Applicants should hold the D.P.M. or other equivalent qualifications. Resident or non-resident. A large modern flat is available if required and accommodation is also available for a single person.

Applications (12 copies), stating age, qualifications and details of appointments held showing dates, with names and addresses of 3 referees, to the Secretary, Park-parade, Harrogate, by 24th November, 1956.

LIVERPOOL REGIONAL HOSPITAL BOARD. Applications are invited for the post of Whole-time ASSISTANT RADIOTHERAPIST (Senior Hospital Medical Officer) to work under the guidance of the Director of Radiotherapeutic Services at the Radium Institute, from whom any further information may be obtained. Applicants must possess a Diploma in Radiology and have previous experience in radiotherapy. Preference will be given to candidates holding the F.F.R. or other higher qualification.

Forms of application from, and to be returned to, Dr. T. Lloyd Hughes, Senior Administrative Medical Officer, Liverpool Regional Hospital Board, 19, James-street, Liverpool, 2, to be received not later than 3rd November, 1956.

VINCENT COLLINGE, Secretary to the Board.

LIVERPOOL REGIONAL HOSPITAL BOARD. The UNITED LIVERPOOL HOSPITALS. Applications are invited for the whole-time post of ASSISTANT RADIOLOGIST for Pædiatric Radiology (Senior Hospital Medical Officer). Duties will be mainly at Alder Hey Children's Hospital and the Royal Liverpool Children's Hospital. Applicants must possess a registrable qualification and a Diploma in Radiology and have had wide experience in the radiology of children.

Forms of application from, and to be returned to, Dr. T. Lloyd Hughes, Senior Administrative Medical Officer, Liverpool Regional Hospital Board, 19, James-street, Liverpool, 2, to be received not later than 3rd November, 1956.

VINCENT COLLINGE, Secretary to the Board.

LIVERPOOL REGIONAL HOSPITAL BOARD. Aintree AND WALTON HOSPITALS. Applications are invited for the post of Whole-time ASSISTANT RADIOLOGIST (Senior Hospital Medical Officer) with duties at the above hospitals. Aintree Hospital is a Chest Hospital of 550 Beds and Walton Hospital an acute general hospital of 1300 Beds with an associated Neurosurgical Unit. Applicants should possess a Diploma in Radiology and have wide experience in radiology.

Forms of application from, and to be returned to, Dr. T. Lloyd Hughes, Senior Administrative Medical Officer, Liverpool Regional Hospital Board, 19, James-street, Liverpool, 2, to be received not later than 3rd November, 1956.

VINCENT COLLINGE, Secretary to the Board.

MANCHESTER REGIONAL HOSPITAL BOARD. Whole-time NON-RESIDENT ASSISTANT RADIOLOGIST (Senior Hospital Medical Officer) to the Stockport and Buxton and Macclesfield and District Hospital Centres, mainly at the Macclesfield General Hospital, Stockport Infirmary and Stepping Hill Hospital, Stockport. Wide experience, higher qualifications essential; appointee to work under general guidance of Consultants.

Application forms from the Senior Administrative Medical Officer to the Board, Cheetwood-road, Manchester, 8, to be returned by 30th October, 1956.

MANCHESTER. UNITED MANCHESTER HOSPITALS. MANCHESTER ROYAL EYE HOSPITAL. Applications are invited for the post of Part-time (9 sessions) SENIOR HOSPITAL MEDICAL OFFICER (non-resident). Previous experience in ophthalmology essential. The terms and conditions of service for hospital medical and dental staffs will apply.

Applications, giving details of past experience and qualifications, together with the names of 3 referees, to be addressed to the undersigned as early as possible. (Special application forms can be obtained on request.)

F. J. CABLE, Secretary, United Manchester Hospitals.
The Lodge, Oxford-road, Manchester, 13.

NEWCASTLE REGIONAL HOSPITAL BOARD. Tees-SIDE HOSPITAL MANAGEMENT COMMITTEE. STOCKTON AND THORNABY HOSPITAL. Locum SENIOR CASUALTY OFFICER, whole-time for approximately 2 months. Single accommodation available.

Applications, with names and addresses of 3 referees, to Senior Administrative Medical Officer, Benfield-road, Newcastle upon Tyne, 6, immediately.

NORTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD.

(1) CONSULTANT ANÆSTHETIST (3 half-days a week), Watford Hospitals. (Peace Memorial Hospital, 196 Beds; Shrodells, 379 Beds; Watford Maternity, 58 Beds). Hospitals may be visited by arrangement with the Hospital Secretary, Peace Memorial Hospital, Watford, Herts.

Applications before 19th November, 1956.

(2) CONSULTANT RADIOLOGIST (3 half-days a week) Harefield Hospital, Harefield, Middlesex (620 Beds). Hospital may be visited by direct appointment.

Applications before 21st November, 1956.

Application forms obtainable from, and returnable to, Secretary, North West Metropolitan Regional Hospital Board, 11A, Portland-place, W.1.

SCOTLAND. EASTERN REGIONAL HOSPITAL BOARD. DUNDEE GENERAL HOSPITALS. Applications are invited from registered medical practitioners for the appointment of DEPUTY GROUP MEDICAL SUPERINTENDENT to the Board of Management for the Dundee General Hospitals (totalling 1595 Beds). The 2 main hospitals in the group are Dundee Royal Infirmary (534 Beds) and Maryfield Hospital (369 Beds). These hospitals are teaching hospitals associated with the Medical School of St. Andrews University. The duties are entirely administrative. Salary £1250–£66 13s. 4d.–£1450. The post is non-resident.

Further particulars and a form of application may be obtained from the Secretary, Eastern Regional Hospital Board, "Bracknowe," 430, Blackness-road, Dundee, with whom applications should be lodged not later than 31st October, 1956. Canvassing whether direct or indirect will be a disqualification.

SCOTLAND. SOUTH-EASTERN REGIONAL HOSPITAL BOARD. Applications are invited for the appointment of Whole-time RADIOLOGIST (Senior Hospital Medical Officer grade) for duty in the area of the East and West Fife Boards of Management.

Applications, giving particulars of age, qualifications and previous experience, together with the names of 3 referees, should be sent to the Secretary, South-Eastern Regional Hospital Board, Scotland, 11, Drumsheugh-gardens, Edinburgh, 3, by 3rd November, 1956.

SCOTLAND. WESTERN REGIONAL HOSPITAL BOARD. Applications are invited for the following appointments:—

CONSULTANT SURGEON at the Royal Infirmary, Glasgow. The appointment will be part-time and remunerated on the basis of 7 notional half-days per week.

CONSULTANT SURGEON in charge of wards at the Royal Alexandra Infirmary, Paisley, and with duties at other hospitals in the area. The appointment will be part-time and remunerated on the basis of 8 notional half-days per week.

These appointments are subject to the National Health Service (Scotland) superannuation regulations.

Applications (16 copies), stating date of birth, qualifications, experience, present appointment, and the names of 3 referees, to reach the Secretary, Western Regional Hospital Board, 64, West Regent-street, Glasgow, C.2, not later than 30 days after the publication of this advertisement.

SOUTH EAST METROPOLITAN REGIONAL HOSPITAL BOARD. Applications are invited to fill a vacancy for a CONSULTANT ANÆSTHETIST (part-time 9 notional half-days a week) at the Tunbridge Wells Group of hospitals. In addition to duties at the general hospitals in the group, the successful candidate will be required to work at the Plastic Surgery and Jaw Injuries Centre, Queen Victoria Hospital, East Grinstead. Candidates must have had wide experience in anæsthetics and hold the qualification of D.A. or preferably F.F.A.R.C.S. Applicants may visit the hospitals concerned.

Apply, stating nationality, age, sex, qualifications, and experience, including details of present appointment and of war service, together with the names and addresses of 3 referees, to the Secretary, Advisory Appointments Committee, South East Metropolitan Regional Hospital Board, 11, Portland-place, W.1, not later than 27th October, 1956.

SOUTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD requires Whole-time ASSISTANT PSYCHIATRIST (Senior Hospital Medical Officer grade) at St. Lawrence's Hospital, Caterham, Surrey (2250 Beds), a hospital for treatment and training of mental defectives of both sexes, of varying grades and types and of all ages. Candidates should possess D.P.M.

Applications by letter (5 copies), giving date of birth, qualifications, experience, and names of 3 referees, to Secretary (S.I.), South West Metropolitan Regional Hospital Board, 11A, Portland-place, W.1, by 10th November, 1956. Applicants may visit Hospital by local arrangement.

NORTHERN IRELAND HOSPITALS AUTHORITY invite applications for a post as CONSULTANT ORTHOPÆDIC SURGEON at hospitals managed by the South Belfast Hospital Management Committee, the Orthopædic Hospital, Greenisland, and orthopædic clinics outside Belfast. The appointment will be on a part-time basis of 9 half-days of duty weekly and the terms and conditions will be in accordance with the application of the Spens report to Northern Ireland.

Applications to be made on a form obtainable (with further particulars) from the Secretary, Northern Ireland Hospitals Authority, 44–46, Queen-street, Belfast, and to be returned not later than 27th October, 1956.

NORTHERN IRELAND HOSPITALS AUTHORITY. Applications are invited for a post as CONSULTANT ANÆSTHETIST at the Ulster Hospital for Children and Women, the Royal Victoria Hospital and the Northern Ireland Radiotherapy Centre. The appointment will be on a part-time basis of 8 half-days of duty weekly and the terms and conditions will be in accordance with the application of the Spens report to Northern Ireland.

Applications to be made on a form obtainable (with further particulars) from the Secretary, Northern Ireland Hospitals Authority, 44–46, Queen-street, Belfast, and to be returned not later than 3rd November, 1956.

MALAYA. THE LADY TEMPLER HOSPITAL, Kuala LUMPUR, MALAYA. The Board of Governors of The Lady Templer Hospital, Kuala Lumpur, invite applications from those of Consultant rank possessing considerable experience in chest anæsthesia, including pulmonary, œsophageal and cardiovascular work, for the appointment of ANÆSTHETIST. The Hospital is modern with fully up-to-date ancillary services. The appointment will be full-time, and for a period of 3 years. Salary will be between $1700 and $2000 (Malayan dollars or £198 and £233) per month, inclusive of basic pay and allowances. Free, partly furnished quarters will be provided; local leave at the rate of 14 days p.a. will be granted, and at the end of each tour of service fully paid (basic) leave at the rate of 5 days per month of completed service will be granted. First-class passages to and from the country of domicile for officer, wife, and a maximum of 3 children under the age of 10 years will be paid at the beginning and end of each tour. On satisfactory completion of his contract the officer will receive a gratuity of between £350 and £450 (Sterling) p.a., depending on basic salary, for each completed year of service.

Applications, stating date of birth, marital status, qualifications and experience, with the names of 3 referees, to be sent care of House Governor, Brompton Hospital, Fulham-road, S.W.3, by 14th November, 1956, from whom further details may be obtained on request.

Hospital Services : Junior Appointments

BOLINGBROKE HOSPITAL, Wandsworth Common, S.W.11. HOUSE SURGEON (resident) required from 19th October, 1956. Open to registered practitioners and pre-registration candidates.

Apply Hospital Secretary, enclosing copies of 3 recent testimonials.

CONNAUGHT HOSPITAL, Walthamstow, E.17. (118 Beds.) Applications are invited for the post of SECOND CASUALTY OFFICER with duties in the Department of Orthopædic and Traumatic Surgery (Senior House Officer grade). Recognised for F.R.C.S. Salary £745 p.a., less £150 p.a. for board, lodging, &c.

Applications, with full details and copies of 2 recent testimonials, should be sent immediately to Secretary, Hospital Management Committee, Forest Group, Langthorne-road, E.11.

CONNAUGHT HOSPITAL, Walthamstow, E.17. (118 Beds.) HOUSE SURGEON required for 6 months (General Surgery and Special Departments). Post vacant 1st December, 1956. Recognised for F.R.C.S.

Applications, with full details and copies of 2 recent testimonials, should be sent immediately to Secr tary, Hospital Management Committee, Forest Group, Langthorne-road, E.11.

ELIZABETH GARRETT ANDERSON HOSPITAL, Euston-road, N.W.1. ROYAL FREE HOSPITAL GROUP. Applications are invited from pre-registration and registered Women medical practitioners for the post of SECOND HOUSE PHYSICIAN. Appointment for 6 months from 1st December, 1956. Salary according to Ministry of Health scale for House Officers.

Applications, with copies of 3 recent testimonials, should be sent to the Secretary, Elizabeth Garrett Anderson Hospital, by 16th October, 1956.

FOREST GATE HOSPITAL, Forest-lane, E.7. Pre-registration OBSTETRIC HOUSE OFFICER (second post) required for 6 months commencing 1st December, 1956. The appointment is recognised for training candidates for D.Obst. R.C.O.G.

Applications, with names of 2 referees, to Hospital Secretary by 20th October, 1956.

HACKNEY HOSPITAL, London, E.9. (General—841 Beds.) Applications are invited for the resident appointment (for a period of 6 months in the first instance) of SENIOR HOUSE OFFICER (orthopædic), post vacant mid-November and should reach the Secretary at above address by 23rd October quoting HH/SHO/O.

HOSPITAL OF ST. JOHN AND ST. ELIZABETH, 60, Grove End-road, London, N.W.8. Applications are invited from pre-registration or registered medical practitioners (Male) for the appointment of HOUSE SURGEON, to become vacant on Monday, 19th November, 1956. This post is recognised for purposes of the F.R.C.S. (Eng.). Appointment will be for a period of 6 months. National Health Service salary.

Applications should reach the Secretary on or before Friday, 26th October, together with copies of 3 recent testimonials.

MILE END HOSPITAL, Bancroft-road, London, E.1. (484 Beds.) ANÆSTHETIST (Senior House Officer). Recognised for F.F.A.R.C.S. Post vacant 26th October, 1956.

Application forms, obtainable from Physician-Superintendent, to be returned by 19th October, 1956, with copies of not more than 3 testimonials.

MILE END HOSPITAL, Bancroft-road, London, E.1. (484 Beds.) CASUALTY AND RECEIVING-WARD OFFICER (Senior House Officer). Recognised for F.R.C.S. Post vacant 8th November, 1956.

Application forms, obtainable from Physician-Superintendent, to be returned by 19th October, 1956, with copies of not more than 3 testimonials.

MILE END HOSPITAL, Bancroft-road, London, E.1. (484 Beds.) HOUSE PHYSICIAN (pre- or post-registration). Post vacant immediately.

Application forms, obtainable from Physician-Superintendent, should be returned as soon as possible, with copies of not more than 3 testimonials.

LONDON CHEST HOSPITAL. 2 vacancies occur 1st December, 1956, for RESIDENT HOUSE PHYSICIAN. Appointment for 6 months, 4 in London, 2 at the Country Branch, near Letchworth, and post graded as House Officer. Duties include work in the Outpatient Department and Refill Clinic, as well as in wards.

Applications, stating date of birth, qualifications with dates, and previous appointments held, with copies of 3 testimonials, should reach the undersigned not later than 23rd October.

THOMAS BROWN, House Governor.

London Chest Hospital, E.2.

LONDON HOSPITAL, Whitechapel, E.1. Applications are invited for the post of REGISTRAR in General Surgery. A higher qualification, although desirable, is not essential. The appointment will be for 1 year, renewable for 2 further years of which 1 will be spent in the Department of Thoracic Surgery or at the Hospital's Annexe at Brentwood.

Applications (12 copies), giving the names and addresses of 3 referees, should be received by the undersigned by 31st October, 1956. H. BRIERLEY, House Governor.

NATIONAL HOSPITALS FOR NERVOUS DISEASES. Applications are invited from registered medical practitioners for the appointment of HOUSE SURGEON at The National Hospital, Queen-square, W.C.1, commencing 1st December, 1956. This post carries the grade of Registrar.

Applications, giving the names of 3 referees, to be sent to the undersigned not later than 27th October, 1956.

H. EWART MITCHELL,
Secretary to the Board of Governors.

NELSON HOSPITAL, Kingston-road, Merton, S.W.20. HOUSE SURGEON (resident), vacant 22nd November. Post recognised for F.R.C.S.

Applications, stating age, qualifications, &c., with the names and addresses of 2 referees, to the Secretary at above address.

NORTH EAST METROPOLITAN REGIONAL HOS-PITAL BOARD.

REGISTRAR in Infectious Diseases and General Medicine (resident or non-resident), Rush Green Hospital, Romford, Essex. Regional Polio Unit (30 Beds) and approximately 10 medical beds. Excellent experience in wide variety of positive and negative pressure apparatus. Applicants may visit the Hospital by appointment (Tel.: Romford 7711).

MEDICAL REGISTRAR (resident or non-resident, sleeping in on duty nights), St. Andrew's Hospital, Bow, E.3.

MEDICAL REGISTRAR (resident or non-resident, sleeping in on duty nights), Wanstead Hospital, Wanstead, E.11.

MEDICAL REGISTRAR (resident), Rochford General Hospital, Rochford, Essex. Senior resident post with some responsibility for organisation of Junior staff duties.

Part-time E.N.T. REGISTRAR (non-resident) (4 sessions a week), Queen Elizabeth Hospital for Children, Hackney, E.2. Experience in treatment of diseases of children desirable.

ORTHOPÆDIC REGISTRAR (resident), St. Andrew's Hospital, Billericay, Essex. Recognised for F.R.C.S.

OBSTETRIC REGISTRAR (resident if single, unfurnished flat available for married candidate). Barking Hospital, Barking, Essex.

REGISTRAR in Obstetrics and Gynæcology (resident), St. Andrew's Hospital, Devons-road, E.3.

SURGICAL REGISTRAR (resident or non-resident), St. Mary's Hospital for Women and Children, Plaistow, E.13.

Appointments subject to review after 1 year.

Application forms from Secretary, 11a, Portland-place, W.1, to be returned by 27th October.

NORTH MIDDLESEX HOSPITAL, Edmonton, N.18. Applications are invited for the post of RECEIVING-ROOM OFFICER (Senior House Officer), non-resident. Duties: hospital admissions. Hours: 9.30 A.M.–5.30 P.M. Monday–Friday; 9.30 A.M.–1 P.M. Saturday; Sunday free. Candidates should have held House Officer posts. 6 months appointment. Vacant 14th November

Applications, stating age, qualifications, experience, nationality, with copies of recent testimonials and/or names of 2 referees, to Secretary of Hospital by 23rd October.

PRINCE OF WALES'S GENERAL HOSPITAL, N.15. (248 Beds.) Applications are invited from qualified medical practitioners for appointment as RESIDENT JUNIOR HOUSE SURGEON for casualty (pre-registration first or second post) for a period of 6 months, vacant 1st December, 1956.

Application form from Secretary, Tottenham Group Hospital Management Committee (Group 4), The Green, N.15, to be returned by 27th October, 1956.

QUEEN ELIZABETH HOSPITAL FOR CHILDREN MANAGEMENT COMMITTEE. Hackney-road, E.2, Shadwell, E.1, and BANSTEAD WOOD, SURREY. HOUSE OFFICERS (2). Appointments will be made for 2 consecutive periods of 6 months commencing 1st December, 1956. First period as House Physician and second as House Surgeon and Casualty Officer.

Application forms may be obtained from the Secretary at Hackney-road and should be returned with copies of not more than 3 testimonials on or before 22nd October, 1956.

ROYAL FREE HOSPITAL GROUP. Hampstead General HOSPITAL AND ELIZABETH GARRETT ANDERSON HOSPITAL. Applications are invited for the post of REGISTRAR to the E.N.T. Department at the Hampstead General Hospital and Elizabeth Garrett Anderson Hospital. Applicants should be registered practitioners of not more than 10 years standing.

Application forms may be obtained from the Secretary to the Board of Governors, Royal Free Hospital, Gray's Inn-road, W.C.1, to whom they should be returned not later than 26th October, 1956.

ROYAL NATIONAL ORTHOPÆDIC HOSPITAL, Brockley Hill, STANMORE, MIDDLESEX. Applications are invited for the post of RESIDENT SENIOR HOUSE OFFICER for a period of 6 months: duties to commence 21st December, 1956.

Applications to be received by 31st October. Forms of application can be obtained from the House Governor at 234, Great Portland-street, London, W.1.

ROYAL NORTHERN HOSPITAL, N.7. North West METROPOLITAN REGIONAL HOSPITAL BOARD. REGISTRAR in Radiology, X-ray Diagnostic Department, required at above Hospital. D.M.R.D. essential. Hospital may be visited by direct appointment.

Application forms obtainable from, and returnable to, the Secretary, Royal Northern Hospital, Holloway-road, London, N.7, by 23rd October, 1956.

SOUTH LONDON HOSPITAL FOR WOMEN AND CHILDREN, Clapham Common, S.W.4. Applications are invited from pre-registration and registered Female medical practitioners for the appointment of HOUSE SURGEON, vacant 22nd December, 1956, for a period of 6 months, recognised for F.R.C.S.

Forms of application from the Secretary.

ST. BARTHOLOMEW'S HOSPITAL, E.C.1. Applications are invited for the post of SENIOR HOUSE OFFICER in the Department of Radiotherapy, for a period of 1 year with effect from 1st January, 1957.

Applications, with the names of 2 referees, should be submitted to the undersigned by 1st November, 1956.

C. C. CARUS-WILSON, Clerk to the Governors.

ST. CLEMENT'S HOSPITAL, London, E.3. Senior House OFFICER required for Psychiatric Unit consisting of 24 observation beds and 36 beds for treatment of neuroses and early psychoses. Unit run in conjunction with the London and Claybury Hospitals. Post recognised for D.P.M. Vacant now.

Apply to Group Secretary, Bow Group Hospital Management Committee, Committee Offices, 2A, Bow-road, E.3, with names of 3 referees.

ST. JAMES' HOSPITAL, Balham, London, S.W.12. SOUTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD. REGISTRAR in Physical Medicine required.

Application forms obtainable from the Group Secretary, Wandsworth Hospital Group, at above address. (42770.)

ST. JAMES' HOSPITAL, Balham, London, S.W.12. SOUTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD. ANÆSTHETIC REGISTRAR required 1st December. Post recognised for D.A. and F.F.A.R.C.S.

Application forms, obtainable from Group Secretary, Wandsworth Hospital Group, at above address, to be completed and returned by 27th October.

ST. LEONARD'S HOSPITAL, Nuttall-street, London, N.1. (Acute general—192 Beds.) Applications are invited from registered or provisionally registered medical practitioners for the post of HOUSE SURGEON. Post vacant immediately.

Applications, with copies of 2 testimonials, to the Hospital Secretary.

ST. NICHOLAS HOSPITAL, Plumstead, S.E.18. Senior HOUSE OFFICER (Orthopædic, Fracture and Casualty Departments), vacant early November. Recognised for F.R.C.S. 6 months appointment and may then be renewed. Salary £745 p.a., less £150 p.a. for residence.

Apply to Group Secretary, Memorial Hospital, Woolwich, S.E.18.

ST. THOMAS'S HOSPITAL, London, S.E.1. Obstetric HOUSE PHYSICIAN at the General Lying-in Hospital, York-road, S.E.1, for a period of 6 months from 1st January, 1957. Resident. Approved service for M.R.C.O.G.

Applications, from fully registered medical practitioners only, to the Clerk of the Governors by 26th October, 1956, naming 2 referees.

ST. MARY'S HOSPITAL, Paddington, W.2. Applications are invited for the post of SENIOR REGISTRAR to the Almroth Wright Ward. The duties of the post require that 6 notional half-days should be devoted to the clinical charge of the 17 beds of the Wright Fleming Institute, together with some laboratory work in connection with cases in the wards. The remaining 5 notional half-days to be devoted to research work in the Wright Fleming Institute of Microbiology. Some previous laboratory experience is desirable. The appointment will be for a period of 12 months as from a date to be arranged. The grading of the post is Senior Registrar and payment will be made by the Board of Governors for 6 notional half-days; payment for the remaining 5 notional half-days will be made by the Wright Fleming Institute. The total salary, therefore, will be equivalent to a whole-time Senior Registrar appointment.

Applications, stating nationality, date of birth, permanent address, qualifications with dates, and details of previous and present appointments, with gradings, together with the names and addresses of 3 referees, should reach ALAN POWDITCH, House Governor, not later than 23rd October, 1956.

ST. MARY'S HOSPITAL, Paddington, W.2. Applications are invited for the post of SENIOR REGISTRAR to the Paediatric Department at St. Mary's Hospital. Previous experience in pediatrics is necessary; preference will be given to candidates holding the M.R.C.P. The successful candidate will be required to undertake duties in the Pædiatric Unit at St. Mary's Hospital as well as at the Constituent Children's Hospitals. The appointment will be for a first period of 12 months, with effect from 1st January, 1957, the holder being eligible for reappointment; remuneration to be at Senior Registrar rates. The successful applicant may be eligible to participate in an exchange scheme with the Children's Medical Centre, Boston (Harvard University).

Applications, stating nationality, date of birth, permanent address, qualifications with dates, details and National Health Service gradings of previous and present appointments, together with the names and addresses of 3 referees, should reach ALAN POWDITCH, House Governor, not later than 23rd October, 1956.

ST. MARY'S HOSPITAL, W.2. Applications are invited for the post of SENIOR REGISTRAR to the Department for Diseases of the Skin. Candidates must be registered medical practitioners. Preference will be given to Members of the Royal College of Physicians. The appointment is for a first period of 12 months and the successful candidate, who will be eligible for re-election, will be required to take up his duties as soon as possible.

Applications, stating nationality, date of birth, permanent addresses, qualifications with dates, details and National Health Service gradings of previous and present appointments, together with the names and addresses of 3 referees, should reach ALAN POWDITCH, House Governor, not later than 23rd October, 1956.

ST. GEORGE'S HOSPITAL AND THE ROYAL HAMP-SHIRE COUNTY HOSPITAL, WINCHESTER. (Joint appointment.) Applications are invited for the post of SURGICAL FIRST ASSISTANT in the grade of Senior Registrar. Candidates should hold the Diploma of Fellow of the Royal College of Surgeons (England). The appointment will be for 1 year in the first instance, and the successful candidate will be required to take up duty as soon as possible after 1st December, 1956. The successful candidate will be required to serve part of the normal period as Senior Registrar in the St. George's Hospital group and part at the Royal Hampshire County Hospital, Winchester.

Applications, stating age, education, qualifications, experience, and the names of 2 referees, should reach the undersigned not later than 3rd November, 1956.

P. H. CONSTABLE, House Governor.

St. George's Hospital, S.W.1.

THORPE COOMBE MATERNITY HOSPITAL, Walthamstow, E.17. (58 Beds.) Applications are invited from medical Women for the post of JUNIOR OBSTETRIC OFFICER (graded House Officer), vacant 19th November, 1956. The Hospital is recognised by the Royal College of Obstetricians and Gynæcologists.

Applications, with full details and copies of 2 recent testimonials, should be sent immediately to Secretary, Hospital Management Committee, Forest Group, Langthorne-road, E.11.

UNIVERSITY COLLEGE HOSPITAL, Gower-street, W.C.1. Applications are invited for the post of SENIOR HOUSE OFFICER in Anæsthetics for 6 months from 1st November, 1956, or as soon as possible thereafter. The post will be non-resident.

Applications, with the names of 2 referees, to Administrator and Secretary by 24th October, 1956.

WEST LONDON HOSPITAL, Hammersmith-road, London, W.6. 2 RESIDENT HOUSE PHYSICIANS (general medicine) required 1st December. Pre-registration candidates considered.

Applications, stating age, qualifications, experience, 2 copies of recent testimonials, to Secretary by 22nd October.

WEST LONDON HOSPITAL, Hammersmith-road, W.6. CLINICAL ASSISTANT (psychological medicine) required for 3 sessions per week (Monday, Wednesday, and Friday mornings). Salary £175 p.a. per session.

Appl cations, stating age, qualifications, experience, names of 2 referees, to Secretary by 22nd October.

WHITTINGTON HOSPITAL, London, N.19. Whole-time SENIOR PÆDIATRIC REGISTRAR required. Unit consists of 53 Beds in addition to 64 neonatal cots. Duties include some Undergraduate teaching. Possession of a higher qualification will be an advantage. Candidates may visit the Hospital by direct arrangement with the Medical Superintendent.

Application forms obtainable from, and returnable to, the Group Secretary, Archway Group Hospital Management Committee, 46, Cholmeley-park, N.6, by 22nd October, 1956.

WOOLWICH GROUP HOSPITAL MANAGEMENT COM-MITTEE. SENIOR HOUSE OFFICERS (anæsthetics). 2 posts vacant early November, 1 at St. Nicholas Hospital, Plumstead, and 1 at Memorial Hospital, Woolwich. Both recognised for F.F.A.R.C.S. and D.A. 6 months resident appointments and may then be renewed.

Apply to Group Secretary, Memorial Hospital, Woolwich, S.E.18.

ABERDEEN GENERAL HOSPITALS BOARD OF MAN-AGEMENT. Applications are invited for the appointment of REGISTRAR in Anæsthetics in the Aberdeen Royal Infirmary and Woodend General Hospital. Conditions of service in accordance with the terms issued by the Department of Health for Scotland.

Applications, with the names of 2 referees, should be lodged immediately with the Group Secretary, Aberdeen General Hospitals, P.O. Box No. 92, 62, Queen's-road, Aberdeen.

ASHFORD HOSPITAL, Ashford, Middlesex. Staines GROUP HOSPITAL MANAGEMENT COMMITTEE. Required, RESIDENT HOUSE SURGEON (Male) for Traumatic and Orthopædic Unit about 1st November, 1956. 6 months appointment suitable for pre-registration candidates.

Applications, stating age, qualifications and experience with copies of up to 3 recent testimonials, to Medical Director of Hospital.

ASHTON, HYDE AND GLOSSOP HOSPITAL MANAGE-MENT COMMITTEE. HOUSE SURGEON required at Ashton-under-Lyne General Hospital. Preference will be given to pre-registration applicants. Recognised for F.R.C.S. (Eng.). Vacant 1st November, 1956.

Applications, with copies of 2 testimonials, to Group Secretary, General Hospital, Ashton-under-Lyne, Lancashire.

BARNSTAPLE. NORTH DEVON INFIRMARY. (Central Group Hospital of 105 Beds.) SENIOR HOUSE SURGEON post vacant from 1st January, 1957, for 1 year. Salary £745 p.a. (5-roomed furnished flat available for rental.)

Applications, with customary details, to Group Secretary, North Devon Hospital Management Committee, 19, Alexandra-road, Barnstaple.

BANGOR. ST. DAVID'S HOSPITAL. (Specialist Hospital for Women and Children.) Applications are invited for the post of RESIDENT PÆDIATRIC OFFICER (Senior House Officer grade). Preference will be given to candidates with previous experience in neonatal and premature infant care. The Pædiatric Unit is recognised for the D.C.H. Salary according to scale.

Applications, stating age, qualifications and experience, together with the names and addresses of 2 referees, should be forwarded within 10 days of the appearance of this advertisement to the Group Secretary, Caernarvon and Anglesey Hospital Management Committee, Plas Gwyn, Ffriddoedd-road, Bangor, North Wales.

BARROW AND FURNESS HOSPITAL MANAGEMENT COMMITTEE. Applications are invited for the resident or non-resident post of REGISTRAR in Anæsthetics in the Barrow and Furness Group of hospitals, based at the North Lonsdale Hospital, Barrow-in-Furness. Hospital approved for D.A.

Applications, giving age, details of experience, and names of 3 referees, to Group Secretary, 105, Abbey-road, Barrow-in-Furness.

BEDFORD GENERAL HOSPITAL. (439 Beds.) House SURGEON required (mainly orthopædic). Pre- or post-registration: recognised for F.R.C.S. Vacant mid-October. Post offers exceptional opportunities for general experience in busy acute surgical units.

Inquiries and applications, with copies of 2 recent testimonials, to Group Secretary, 3, Kimbolton-road, Bedford.

BEDFORD GENERAL HOSPITAL. (439 Beds.) Resident HOUSE SURGEON (gynæcology and obstetrics) required mid-November. Pre-registration post and recognised for D.Obst. R.C.O.G. The unit comprises 26 gynæcological and 60 obstetric beds and a busy Outpatient Department.

Applications, stating age, experience, qualifications, copies of 2 recent testimonials, to Group Secretary, Bedford Group Hospital Management Committee, 3, Kimbolton-road, Bedford, by 17th October, 1956.

BEDFORD GENERAL HOSPITAL. (439 Beds.) North WEST METROPOLITAN REGIONAL HOSPITAL BOARD. GENERAL SURGICAL REGISTRAR (resident) required at above Hospital which may be visited by direct appointment. Post vacant October.

Application forms obtainable from, and returnable to, Group Secretary, Bedford Group Hospital Management Committee, 3, Kimbolton-road, Bedford, as soon as possible.

BEDFORD (near). BROMHAM HOSPITAL. (434 Beds for mental defectives and 60 at Annexe near Sandy.) REGISTRAR in Psychiatry required (resident). Hospital may be visited by direct appointment with the Medical Superintendent (phone: Oakley 295).

Application forms obtainable from, and returnable to, Secretary, Bedford Group Hospital Management Committee, 3, Kimbolton-road, Bedford.

BEVERLEY, YORKSHIRE. WESTWOOD HOSPITAL. (229 Beds.) HOUSE PHYSICIAN (House Officer or Senior House Officer grading according to experience), vacant now. Pre-registration post but fully qualified practitioners may apply.

Applications to Group Secretary.

BROMLEY HOSPITAL, Kent. Senior House Officer (in charge Casualty Department) required for 6 months from 7th November. Recognised for F.R.C.S. Deduction of £150 p.a. for residence.

Apply, stating age, qualifications with dates, previous experience, and naming 3 referees, to Administrative Officer.

BIRMINGHAM ACCIDENT HOSPITAL, Bath-row, BIRMINGHAM, 15. (215 Beds and 8 House Surgeons.) HOUSE SURGEON (resident) vacant now. Recognised for purpose of Casualty by R.C.S. (Eng.). Teaching programme by Consultant Staff. Appointment for 6 months, some of which may be spent, at applicant's request, in 42-Bedded Medical Research Council's Burns Unit.

Apply, naming 2 referees, to Administrator.

BIRMINGHAM REGIONAL HOSPITAL BOARD.

(1) **All Saints' Hospital, Winson Green, Birmingham, 18**

REGISTRAR (psychiatry) for All Saints' Hospital, Birmingham (1385 Beds) and Early Treatment Centre, Ufculme. Candidates should be actively interested in research. Resident post. Married accommodation available.

(2) **Burton-on-Trent Group, General Hospital, Burton-on-Trent**

REGISTRAR (psychiatry) for St. Matthew's Hospital, Burntwood, Lichfield (1350 Beds). Married quarters available.

(3) **Birmingham (Dudley Road) Group, Dudley-road, Birmingham, 18**

REGISTRAR (E.N.T. surgery) at Birmingham and Midland Ear and Throat Hospital. Resident. Recognised for D.L.O. and F.R.C.S.

(4) **Coventry No. 20 Group, Coventry and Warwickshire Hospital, Coventry**

(*a*) REGISTRAR (infectious diseases—62 Beds), Whitley Hospital, Coventry (153 Beds), with occasional duties in medical, skin and chest wards—and liaison with Pædiatric Department. Self-contained flat available. Experience in specialty essential. Higher qualification desirable.

(*b*) REGISTRAR (physical medicine). Coventry Group of hospitals. Non-resident. Duties with Coventry Group of hospitals and Warneford Hospital, Leamington Spa. Experience in specialty essential. Higher qualifications desirable.

(5) **Mid-Worcestershire Group, Birmingham-road, Bromsgrove**

REGISTRAR (obstetrics/gynæcology). Duties in Mid-Worcestershire Group at Bromsgrove General Hospital (423 Beds) (7 notional half-days) and Dudley and Stourbridge Group (4 notional half-days).

Application forms from Group Secretaries, to be returned by 22nd October, 1956.

BIRMINGHAM. THE UNITED BIRMINGHAM HOSPITALS. THE GENERAL HOSPITAL. Applications are invited for the post of RESIDENT CLINICAL PATHOLOGIST (Senior House Officer grade). The post offers wide experience in clinical pathology in a Teaching Hospital laboratory. The appointment is tenable for 12 months from 1st January, 1957.

Application forms may be obtained from the Secretary, United Birmingham Hospitals, Queen Elizabeth Hospital, Birmingham, 15, and should be returned to him by 20th October, 1956.

BIRMINGHAM, 9. YARDLEY GREEN HOSPITAL. THORACIC SURGICAL UNIT. (66 Beds.) Vacancy for SENIOR HOUSE OFFICER. No previous experience in thoracic surgery necessary.

Applications, stating age, qualifications, training, and experience, together with names of 2 referees, to be addressed to Group Secretary, Yardley Green Hospital, Birmingham, 9.

BIRMINGHAM, 9. LITTLE BROMWICH GENERAL HOSPITAL. RESIDENT MEDICAL OFFICER in Infectious Diseases (Senior House Officer grade), vacant 1st November. Hospital serves a wide area and gives opportunities for the study of infectious diseases. Part of Hospital is being developed as a General Hospital, where further experience can be gained.

Apply Physician-Superintendent, with 2 testimonials.

BIRMINGHAM, 18. DUDLEY ROAD HOSPITAL. (780 Beds.) HOUSE SURGEON required. Recognised for pre-registration and F.R.C.S. Unit of approximately 85 adult and children's general surgical beds under control of 2 Consultant Surgeons.

Detailed applications, with copies of 3 recent testimonials, to Group Secretary.

BIRMINGHAM, 18. DUDLEY ROAD HOSPITAL (780 Beds.) SENIOR HOUSE OFFICER (Casualty Department) required (40,000 attendances per year). Resident or non-resident. Recognised for F.R.C.S. Tenable for 6 or 12 months. Vacant 18th December, 1956.

Applications, with copies of 3 recent testimonials, to Group Secretary.

BISHOP'S STORTFORD. HERTS AND ESSEX GENERAL HOSPITAL. (Formerly Haymeads Hospital.) Applications are invited from registered medical practitioners for the appointment of a Whole-time Temporary SURGICAL REGISTRAR to commence immediately for 1 month in first instance followed by engagement on a week-by-week basis.

Applications, giving full details, together with copies of recent testimonials, or the names of referees, to the Group Secretary, Hertford Hospital Management Committee, County Hospital, Hertford, Herts.

BLACKBURN AND DISTRICT HOSPITAL MANAGEMENT COMMITTEE. SENIOR HOUSE OFFICER (anæsthetics) required 1st November, 1956, for duties throughout the Group, mainly at Royal Infirmary, Blackburn. Residence at Queen's Park Hospital, Blackburn. Post recognised for D.A. and F.F.A.R.C.S.

Apply to Secretary of Committee, Hospital Management Committee Office, Royal Infirmary, Blackburn, giving names of 2 referees.

BLACKBURN AND DISTRICT HOSPITAL MANAGEMENT COMMITTEE. SENIOR HOUSE OFFICER (pathology) required for duties at Royal Infirmary, Blackburn (Group Laboratory), but may also be required for duties at Queen's Park Hospital, Blackburn and Victoria Hospital, Accrington, at Consultant's discretion. Recognised for D.Path. Post vacant 1st January or possibly before.

Applications, with names of 2 referees, to Secretary, Hospital Management Committee Office, Royal Infirmary, Blackburn, Lancs.

BOURNEMOUTH (near). CHRISTCHURCH HOSPITAL, CHRISTCHURCH, HAMPSHIRE. BOURNEMOUTH AND EAST DORSET HOSPITAL MANAGEMENT COMMITTEE. 2 HOUSE PHYSICIANS (pre-registration Intern) required for general medicine for posts becoming vacant on 22nd and 29th November, 1956, at the above Hospital of 259 Beds (including 79 acute medical, 34 pædiatric, 6 chest diagnostic and a geriatric unit). Duties also include attendance at outpatient clinics at the Royal Victoria Hospital, Boscombe, Bournemouth.

Applications, with copies of testimonials, to the Hospital Secretary at the Hospital.

BOURNEMOUTH. ROYAL VICTORIA HOSPITAL. (494 Beds.) BOURNEMOUTH AND EAST DORSET HOSPITAL MANAGEMENT COMMITTEE. Applications are invited for the appointment of SENIOR HOUSE OFFICER (resident) orthopædic and casualty combined. The post, which becomes vacant on 10th November, is recognised for the F.R.C.S. examination.

Applications to the Hospital Secretary.

BOURNEMOUTH. ROYAL VICTORIA HOSPITAL, Shelley-road. BOURNEMOUTH AND EAST DORSET HOSPITAL MANAGEMENT COMMITTEE. Applications are invited for the appointment of RESIDENT SENIOR HOUSE OFFICER (anæsthetics). The post, which becomes vacant on 10th November, is recognised for the D.A. and F.F.A.R.C.S., and is tenable for 12 months. Experience with Thoracic Unit available.

Applications to the Hospital Secretary.

BOURNEMOUTH. ROYAL VICTORIA HOSPITAL, Shelley-road, BOSCOMBE. (494 Beds.) BOURNEMOUTH AND EAST DORSET HOSPITAL MANAGEMENT COMMITTEE. Applications are invited for the appointment of HOUSE PHYSICIAN. The post which becomes vacant on 16th November, is recognised for pre-registration purposes.

Applications to the Hospital Secretary.

BRIGHTON. ROYAL SUSSEX COUNTY HOSPITAL. (312 Beds.) 2 HOUSE SURGEONS required mid- and end-October. Recognised for pre-registration and F.R.C.S.

Applications, stating usual particulars, and naming 2 referees, to the Administrative Officer, Royal Sussex County Hospital, Brighton, 7.

BRIGHTON. ROYAL ALEXANDRA HOSPITAL FOR SICK CHILDREN, Dyke-road, BRIGHTON. (130 Beds.) Vacancies for HOUSE PHYSICIAN and HOUSE SURGEON for 6 months from 9th and 12th November, 1956, respectively. Both posts offer wide experience in pædiatrics and are recognised for D.C.H.; that of House Surgeon is open to pre-registration candidates.

Applications, stating age, nationality, qualifications, and experience together with copies of recent testimonials, to be sent to the Administrative Officer as soon as possible.

BRISTOL. COSSHAM/FRENCHAY HOSPITAL MAN-AGEMENT COMMITTEE. FRENCHAY HOSPITAL. (512 staffed beds—expanding.) Applications are invited for the post of SENIOR HOUSE OFFICER in the Regional Department of Neurosurgery. Vacant shortly. This post offers useful surgical experience and the opportunity of gaining a working knowledge of neurological diagnosis. Recognised for F.R.C.S.

Applications to the Secretary, Frenchay Hospital, quoting "N.S.F." Names of 2 referees required.

BRISTOL (near). HAM GREEN HOSPITAL, Pill, near BRISTOL. Applications are invited for the post of SENIOR HOUSE OFFICER in the tuberculosis wards (188 Beds) of the above Hospital. The Hospital is fully equipped for the modern treatment of pulmonary tuberculosis including regular major thoracic surgery.

Applications to Secretary, Ham Green Hospital, Pill, near Bristol.

BRISTOL. SOUTHMEAD GENERAL HOSPITAL GROUP MANAGEMENT COMMITTEE. SENIOR HOUSE SURGEON in Obstetrics required at Southmead Hospital, Bristol (571 Beds including 133 maternity). The person appointed will be attached to the Professorial Unit. The post will be tenable for 6 months.

Applications to be made to the Group Secretary, Southmead Hospital, Bristol.

BRISTOL. THE BOARD OF GOVERNORS OF THE UNITED BRISTOL HOSPITALS AND THE SOUTH-WESTERN REGIONAL HOSPITAL BOARD. Applications are invited by the above Boards for the joint appointment of REGISTRAR in Orthopædic and Traumatic Surgery. The appointment, which is recognised for the F.R.C.S. (England), will be held for 1 year in the first instance and be renewable for a further year. The successful candidate will be appointed to work for the first year mainly at Mount Gold Orthopædic Hospital and the Traumatic Centre at the General Hospitals, Plymouth.

Applications, stating date of birth, qualifications and experience, together with the names and addresses of 2 referees, should be sent to the Secretary of the Regional Hospital Board, 27, Tyndalls Park-road, Bristol. 8, not later than 31st October, 1956.

BRISTOL. THE BOARD OF GOVERNORS OF THE UNITED BRISTOL HOSPITALS AND THE SOUTH-WESTERN REGIONAL HOSPITAL BOARD. Applications are invited by the above Boards for the joint appointment of REGISTRAR in Orthopædic and Traumatic Surgery in the West Cornwall Clinical Area. The Orthopædic and Traumatic Unit, centred on the Royal Cornwall Infirmary, Truro, consists of approximately 135 acute, long-stay, and rehabilitation beds, with 16 peripheral clinics. The appointment will be held for 1 year in the first instance and be renewable for a further year. The successful candidate will be appointed to work for the first year mainly at the Royal Cornwall Infirmary, Truro, but may also be required to undertake sessions in other hospitals in the Group.

Applications, stating date of birth, qualifications, and experience, together with the names and addresses of 2 referees, should be sent to the Secretary of the Regional Hospital Board, 27, Tyndalls Park-road, Bristol, 8, not later than 31st October, 1956.

BRISTOL. THE BOARD OF GOVERNORS OF THE UNITED BRISTOL HOSPITALS AND THE SOUTH-WESTERN REGIONAL HOSPITAL BOARD. Applications are invited by the above Boards for the joint appointment of REGISTRAR in General Surgery. This post becomes vacant on 5th December, 1956. The appointment will be held for 1 year in the first instance and be renewable for a further year. The successful candidate will be appointed to work for the first year mainly at the South Devon and East Cornwall Hospital, Plymouth, but may be required to undertake duties in other hospitals in the Group.

Applications, stating date of birth, qualifications, and experience, together with the names and addresses of 2 referees, should be sent to the Secretary of the Regional Hospital Board, 27, Tyndalls Park-road, Bristol, 8, not later than 31st October, 1956.

BURTON-ON-TRENT (near). BRETBY HALL ORTHO-PÆDIC HOSPITAL. (78 available orthopædic beds.) SHEFFIELD REGIONAL HOSPITAL BOARD. Whole-time RESIDENT REGISTRAR (orthopædics) required for inpatient and operative work with children and adults. Attractive modern house available on rental. Duties include certain outpatient responsibilities at Derbyshire Royal Infirmary. Appointment for 1 year in first instance.

Apply to Secretary, Sheffield Regional Hospital Board, Old Fulwood-road, Sheffield, by 22nd October, 1956, giving age, nationality, qualifications, present and previous appointments with dates, naming 3 referees.

CAMBRIDGE. ADDENBROOKE'S HOSPITAL. House PHYSICIAN for 6 months from 1st December. Recognised Pre-registration Service.

Apply, stating age, nationality, qualifications, and experience with dates, and copies of 3 testimonials, to Secretary by 27th October. Interviews early November.

CHELMSFORD. ST. JOHN'S HOSPITAL. House SURGEON (pre-registration, first or second post). Duties commence 16th November, 1956. The Hospital deals with a large number of routine and emergency cases. The post is recognised for training for the F.R.C.S.

Applications, stating age, nationality, qualifications and experience, together with copies of recent testimonials, should be received not later than 30th October, 1956 by the Secretary, Chelmsford Group Hospital Management Committee, Chelmsford and Essex Hospital, London-road, Chelmsford.

CARDIFF. THE UNITED CARDIFF HOSPITALS. Applications are invited for the post of REGISTRAR to the Department of Obstetrics and Gynæcology in the Cardiff Royal Infirmary and the Maternity Hospital, Cardiff. The appointment is recognised for the M.R.C.O.G.

Application forms can be obtained from the Secretary to the Board at Cardiff Royal Infirmary, Newport-road, Cardiff, and should be returned within 14 days of the appearance of this advertisement.

CARDIFF. THE UNITED CARDIFF HOSPITALS. Applications are invited for the post of REGISTRAR to the Department of Dermatology at the Cardiff Royal Infirmary.

Application forms may be obtained from the Secretary to the Board at Cardiff Royal Infirmary, Cardiff, and should be returned within 14 days of the appearance of this advertisement.

CARSHALTON, SURREY. ST. HELIER HOSPITAL. (711 Beds.) SURGICAL REGISTRAR to 1 of the 2 general Surgical Units, comprising 70 Beds. F.R.C.S. an advantage.

Application forms, obtainable from the Group Secretary, St. Helier Hospital, to be returned not later than 27th October.

CARSHALTON. QUEEN MARY'S HOSPITAL FOR CHILDREN. (853 Beds.) ORTHOPÆDIC REGISTRAR, with some surgical duties, required. Applicants are invited to visit the Hospital by appointment with the Physician-Superintendent.

Applications, which should be made on forms obtainable from the Group Secretary, should be returned immediately.

CHELTENHAM. ST. PAUL'S HOSPITAL. (42 surgical and 93 geriatric beds.) SENIOR HOUSE OFFICER required. Main duties concerned with surgical beds. Person appointed would also be expected to carry out certain duties concerned with geriatric patients.

Applications, giving details of qualifications, experience, and names of 3 referees, to the Group Secretary, General Hospital, Sandford-road, Cheltenham.

CHELTENHAM GENERAL HOSPITAL. (220 Beds.) HOUSE SURGEON required pre- or post-registration. The post offers a wide experience in general surgery, gynæcology, and orthopædic surgery. Post recognised for the F.R.C.S.

Apply Secretary, General Hospital, Cheltenh m.

CHERTSEY, SURREY. ST. PETER'S HOSPITAL. (430 Beds.) Applications are invited for the post of SENIOR MEDICAL REGISTRAR. The Hospital may be visited by arrangement with Physician-Superintendent (Tel. : Ottershaw 441).

Application forms can be obtained from the Group Secretary, Woking and Chertsey Hospital Management Committee, "Huntington," Guildford-road, Chertsey. Closing date 24th October.

CHERTSEY, SURREY. ST. PETER'S HOSPITAL (late Botleys Park War Hospital). (430 Beds.) ORTHOPÆDIC HOUSE SURGEON required from 3rd November, 1956. 100 orthopædic beds. Senior House Officer or House Officer (intern grade). Post recognised for F.R.C.S. and Pre-registration Service. Preference given to provisionally registered candidates. Salary in accordance with terms and conditions of National Health Service.

Applications, together with names and addresses of referees, to be sent to the Physician-Superintendent, St. Peter's Hospital, Chertsey, as soon as possible.

CHICHESTER GROUP HOSPITAL MANAGEMENT COMMITTEE. SOUTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD. RADIOLOGY REGISTRAR. Applications are invited for this appointment in Registrar grade (National Health Service conditions, &c.), £850 p.a. first year and £965 second year. Duties at Royal West Sussex, St. Richard's and Graylingwell (Mental) Hospitals, Chichester, and Bognor War Memorial Hospital (General Practitioners have direct reference to 2 of these). The hospitals may be visited by appointment with the Consultant Radiologist.

Forms of application from Group Secretary, 174, Broyle-road, Chichester, Sussex, to be returned by 29th October. Canvassing disqualifies.

CHICHESTER. ROYAL WEST SUSSEX HOSPITAL. (202 acute beds.) RESIDENT HOUSE SURGEON required for 6 months appointment. National salary scale for first, second or third posts. Post approved for pre-registration practitioners. Also recognised for F.R.C.S. 7 residents including Resident Surgical Officer and 3 House Surgeons. Vacant 29th October, 1956.

Applications, stating age, experience, qualifications, with references or names of referees, to Senior Administrative Officer.

CROYDON. MAYDAY HOSPITAL. (611 Beds.) Surgical REGISTRAR (whole-time) resident when on duty. Post vacant early in November. Candidates should have good medical and surgical background and preferably in possession of higher surgical qualification. There are 2 surgical teams at Hospital. Post recognised for Final F.R.C.S. examination.

Application forms obtainable from GEORGE A. PAINES, Group Secretary, Croydon Hospital Management Committee, General Hospital, Croydon.

CROYDON. MAYDAY HOSPITAL. (611 Beds.) Croydon GROUP HOSPITAL MANAGEMENT COMMITTEE. HOUSE SURGEON (obstetrics and gynæcology) required as from 24th November, 1956. Post recognised for M.R.C.O.G. in Obstetrics.

Application forms obtainable from GEORGE A. PAINES, Group Secretary, Hospital Management Committee, General Hospital, London-road, Croydon.

CROYDON GENERAL HOSPITAL. (200 Beds.) Senior CASUALTY OFFICER (Registrar status). Post vacant. Busy Department. Post recognised for Final F.R.C.S. examination. Accommodation may be inspected on application to Hospital Secretary.

Application forms obtainable from GEORGE A. PAINES, Group Secretary, Hospital Management Committee, General Hospital, London-road, Croydon.

CHESTERFIELD. SCARSDALE HOSPITAL. Senior HOUSE OFFICER for obstetrics and gynæcology required 28th October at above Hospital (with Maternity Unit of 72 Beds). Post recognised for M.R.C.O.G. and D.Obst.R.C.O.G. National salary and conditions.

Apply M. H. BOONE, Secretary, Chesterfield Hospital Management Committee, at Chesterfield Royal Hospital.

CHESTERFIELD ROYAL HOSPITAL. Senior House OFFICER required immediately at above Hospital for Accident and Orthopædic Department. Post recognised for F.R.C.S. training and offers valuable experience. National salary and conditions.

Apply M. H. BOONE, Secretary, Chesterfield Hospital Management Committee.

CLACTON AND DISTRICT HOSPITAL, Clacton-on-Sea. (58 Beds.) Applications invited for post of SENIOR HOUSE OFFICER (Resident Surgical Officer). Post tenable for 1 year.

Applications with copies of 3 testimonials, to Group Secretary, Colchester Hospital Management Committee, 14, Pope's-lane, Colchester, Essex.

COLCHESTER HOSPITAL MANAGEMENT COMMITTEE. Applications are invited for :—

Essex County Hospital, Colchester (188 Beds)

SENIOR HOUSE OFFICER (casualty and radiotherapy). Post recognised for F.R.C.S. ; tenable for 6 months or 1 year.

SENIOR HOUSE OFFICER (anæsthetics). The successful candidate will be called upon to give anæsthetics in other hospitals in the Group. Post recognised for F.F.A.R.C.S. and D.A. ; tenable for 1 year.

Applications, with copies of 3 testimonials, to Group Secretary, 14, Pope's-lane, Colchester, Essex.

CUCKFIELD HOSPITAL, Cuckfield, near Haywards HEATH, SUSSEX. SENIOR RESIDENT HOUSE SURGEON. Post vacant 1st November, 1956. Successful applicant will be responsible for 42 beds for general, E.N.T. and orthopædic surgery.

Applications, stating age, qualifications, nationality and details of experience, together with names of 2 referees, to the Group Secretary, Mid-Sussex Hospital Management Committee, as soon as possible.

DERBY. DERBYSHIRE ROYAL INFIRMARY. (416 Beds. Recognised for training for F.R.C.S.) SHEFFIELD REGIONAL HOSPITAL BOARD. Whole-time RESIDENT REGISTRAR (orthopædics) required. Post vacant 1st January. Appointment for 1 year in first instance.

Apply to Secretary, Sheffield Regional Hospital Board, Old Fulwood-road, Sheffield, by 22nd October, 1956, giving age, nationality, qualifications, present and previous appointments with dates, naming 3 referees.

DERBY. DERBYSHIRE ROYAL INFIRMARY. (416 Beds. Derby Group recognised for training for F.F.A.R.C.S. and D.A.) SHEFFIELD REGIONAL HOSPITAL BOARD. Whole-time RESIDENT REGISTRAR (anæsthetics) required. Duties will include attendances at other hospitals in the Group. Appointment for 1 year in first instance.

Apply to Secretary, Sheffield Regional Hospital Board, Old Fulwood-road, Sheffield, by 22nd October, 1956, giving age, nationality, qualifications, present and previous appointments with dates, naming 3 referees.

DORCHESTER. DORSET COUNTY HOSPITAL. West DORSET GROUP HOSPITAL MANAGEMENT COMMITTEE. SOUTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD. Applications are invited for the post of SURGICAL REGISTRAR (Registrar grade) at above Hospital. Salary according to experience, with a deduction at the rate of £170 p.a. for residence. Canvassing will disqualify, but Hospital may be visited by arrangement.

Application form, obtainable from Group Secretary, West Dorset Group Hospital Management Committee, Damers-road, Dorchester, Dorset.

DOUGLAS, ISLE OF MAN. NOBLE'S ISLE OF MAN HOSPITAL. (160 Beds.) Applications are invited from registered medical practitioners with previous hospital experience, preferably at a teaching hospital, for the post of SENIOR HOUSE SURGEON at this busy General Hospital. The Senior of 4 House Officer posts. The post becomes vacant mid-November, and is suitable for candidate seeking further clinical experience and opportunity for reading for higher qualification. Recognised for F.R.C.S. Salary £745 p.a. with a deduction of £125 p.a. for board, lodging, &c., if resident.

Applications, giving relevant particulars, and copies of 2 recent testimonials, or names and addresses of 2 referees, should be forwarded to the Secretary, Noble's Isle of Man Hospital, Douglas.

DRIFFIELD, YORKSHIRE EAST RIDING GENERAL HOSPITAL. (247 Beds.) HOUSE PHYSICIAN (first, second or third post), vacant soon. Approved pre-registration post. Fully qualified practitioners may apply. Duties to include acute and chronic sick. Good general experience for first house appointment.

Apply Group Secretary, Westwood Hospital, Beverley, Yorkshire.

DRIFFIELD, YORKSHIRE. NORTHFIELD SANATORIUM. (78 Beds.) SENIOR HOUSE PHYSICIAN, vacant now. Offers experience all branches of tuberculosis within Group, including surgery, M.M.R., and clinics. Time for study. Ex-patients welcome. £150 for full residence.

Applications to Group Secretary, Westwood Hospital, Beverley, Yorkshire.

DONCASTER HOSPITAL MANAGEMENT COMMITTEE. HAMILTON ANNEXE, WESTERN HOSPITAL. (Recognised under the regulations for the D.Obst.R.C.O G. and M.R.C.O.G. (obstetrical experience) and approved for Pre-registration Service under the Medical Act, 1950.) Applications are invited for the post of OBSTETRICAL HOUSE OFFICER (Senior House Officer or pre-registration post), vacant early November.

Applications should be forwarded to the Group Secretary at Doncaster Royal Infirmary by 22nd October.

DONCASTER ROYAL INFIRMARY. (330 Beds.) Applications are invited for the post of HOUSE SURGEON. Approved as pre-registration post and recognised for F.R.C.S.

Applications to the Group Secretary, Doncaster Hospital Management Committee, at Doncaster Royal Infirmary.

EAST ANGLIAN REGIONAL HOSPITAL BOARD. SURGICAL REGISTRAR, Norfolk and Norwich Hospital (441 Beds). Recognised for F.R.C.S. Appointment for 1 year, renewable for second year.

Applications, stating age, experience and the names of 3 referees, to Board's Senior Administrative Medical Officer, 117, Chesterton-road, Cambridge, by 22nd October, 1956. Candidates are invited to visit the Hospital by direct arrangement with Hospital Management Committee Secretary at the Hospital.

EDGWARE GENERAL HOSPITAL, Edgware, Middlesex. (715 Beds.) JUNIOR HOSPITAL MEDICAL OFFICER (non-resident), required in the Casualty Department at above Hospital.

Apply, stating age, nationality, qualifications and experience, together with names and addresses of 2 referees, to Group Secretary, Edgware General Hospital, by 20th October, 1956.

EDGWARE GENERAL HOSPITAL. (715 Beds.) North WEST METROPOLITAN REGIONAL HOSPITAL BOARD. REGISTRAR (whole-time), resident, required in Department of Anæsthesia at above Hospital. Vacant 5th November, 1956. Hospital may be visited by direct appointment with Medical Director.

Application forms obtainable from, and returnable to, Group Secretary, Edgware General Hospital, Edgware, Middlesex, by 23rd October, 1956.

EDGWARE GENERAL HOSPITAL, Edgware, Middlesex. 2 RESIDENT HOUSE PHYSICIANS for above Hospital. Posts vacant 29th November, 1956, and 6th December, 1956. 6 months appointments. Posts recognised for pre-registration purposes.

Applications, stating age, qualifications, experience, and enclosing copies of up to 3 recent testimonials, to Medical Director of Hospital by 27th October, 1956.

ENFIELD, MIDDLESEX. WAR MEMORIAL HOSPITAL, CHASE SIDE. RESIDENT SENIOR HOUSE OFFICER required for general medical and surgical duties in this Acute General Hospital of 61 Beds. Vacant now. 12 months appointment. Deduction of £150 p.a. for residential emoluments.

Applications, with names and addresses of 2 referees, to the Group Secretary, Enfield Group Hospital Management Committee, Chase Farm Hospital, The Ridgeway, Enfield, Middlesex.

EPPING. ST. MARGARET'S HOSPITAL. Epping GROUP HOSPITAL MANAGEMENT COMMITTEE. SENIOR HOUSE OFFICER required for Chest Department and to act as Second Resident Anæsthetist. Good opportunity for experience in modern methods. Previous experience in chest diseases desirable but not essential.

Applications, with references, to reach Group Secretary, Epping Group Hospital Management Committee, "Oak Cottage," The Plain, Epping, Essex, by 26th October.

EPPING. ST. MARGARET'S HOSPITAL. Epping Group HOSPITAL MANAGEMENT COMMITTEE. SENIOR HOUSE OFFICER (orthopædic) as Orthopædic House Surgeon and Casualty Officer. Recognised training post for F.R.C.S. Busy General Hospital with easy access to London. Salary on national scale less deduction for board, lodging, &c.

Applications, with copies of 2 recent testimonials, to the Group Secretary, Epping Group Hospital Management Committee, "Oak Cottage," The Plain, Epping, Essex, by 26th October.

EPSOM, SURREY. WEST PARK HOSPITAL. Junior HOSPITAL MEDICAL OFFICER required. Salary scale £775–£1075. Subject to Whitley Council conditions and National Health Service superannuation regulations. West Park is a psychiatric hospital with 2400 beds, where all modern treatments are practised. A good knowledge of general medicine is essential. Applicants may be of either sex, and single quarters are available.

Applications, including the names of 3 referees, should be sent to the Physician-Superintendent within 10 days.

EPSOM GROUP HOSPITAL MANAGEMENT COMMITTEE. SOUTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD. Applications are invited for Whole-time REGISTRAR in Chest Medicine to the Epsom and Dorking Chest Clinics, vacancy 1st December, 1956. Duties will include sessions at 1 or both clinics. Additionally person appointed will be Registrar at Cheam Sanatorium, where there are 53 Beds for the treatment of cases of pulmonary tuberculosis, and will have the day-to-day care of patients under the various Consultants concerned. Successful candidate will be required to live within easy access of Cheam Sanatorium. Applicants may visit Units by arrangement with Consultant Chest Physician.

Application forms may be obtained from Group Secretary, Epsom District Hospital, Dorking-road, Epsom (send stamped addressed foolscap envelope), for completion and return within 14 days.

EXETER CLINICAL AREA. The Board of Governors of THE UNITED BRISTOL HOSPITALS AND THE SOUTH-WESTERN REGIONAL HOSPITAL BOARD. Applications are invited by the above Boards for the joint appointment of REGISTRAR in Paediatrics. The appointment will be held for 1 year in the first instance, and be renewable for a further year. The successful candidate will be appointed to work for the first year mainly at the Royal Devon and Exeter Hospital, Exeter, but may be required to undertake duties in other hospitals in the area.

Applications, stating date of birth, qualifications, and experience, together with the names and addresses of 2 referees, should be sent to the Secretary of the Regional Hospital Board, 27, Tyndalls Park-road, Bristol, 8, not later than 31st October, 1956.

GLASGOW ROYAL INFIRMARY. Senior House Officer in E.N.T. Surgery. Duties at above Infirmary.

Write, giving 3 names for reference, not later than 27th October, 1956, to the Secretary, Board of Management for Glasgow Royal Infirmary and Associated Hospitals, 135, Buchanan-street, Glasgow, C.1.

GLASGOW, N.1. STOBHILL GENERAL HOSPITAL. Applications are invited for the post of JUNIOR HOSPITAL MEDICAL OFFICER in the Acute Geriatric Unit (70 Beds—for assessment and rehabilitation) supervised by a consultant physician specialising in geriatrics. The appointment offers excellent clinical experience in the diagnosis and treatment of acute and other illnesses in the elderly and will be for 2 years in the first instance.

Applications, stating age, qualifications and experience with the names of 2 referees, to be sent to the Medical Superintendent.

GLASGOW, S.W.1. SOUTHERN GENERAL HOSPITAL. SENIOR HOUSE OFFICER in Anæsthetics. The post is approved for D.A. and F.F.A.R.C.S.

Write immediately to Secretary, Board of Management for Glasgow South-Western Hospitals, 1301, Govan-road, Glasgow, S.W.1, naming 2 referees.

GLASGOW VICTORIA HOSPITALS BOARD OF MANAGEMENT. RESIDENT JUNIOR HOSPITAL MEDICAL OFFICER (temporary) required for Bellefield Sanatorium, Lanark.

Applications to the Secretary and Treasurer, Board of Management for Glasgow Victoria Hospitals, 24, St. Vincent-place, Glasgow, C.1.

GLASGOW. VICTORIA INFIRMARY. Senior House OFFICER (anæsthetics). Non-resident post recognised for F.F.A.R.C.S. and D.A.

Applications, with names of 2 referees, to the Secretary, Board of Management for Glasgow Victoria Hospitals, 24, St. Vincent-place, Glasgow, C.1, not later than 15th October, 1956.

GLOUCESTER. HORTON ROAD AND CONEY HILL HOSPITALS. (1450 Beds.) Applications invited for the appointment of a JUNIOR HOSPITAL MEDICAL OFFICER. Hospital serves the North Gloucestershire Clinical Area including Gloucester, Cheltenham, Stroud and Forest of Dean. High admission-rate (800). All modern methods of treatment. New units provided for treatment of neurosis and alcoholism. Expanding outpatient services, long-stay annexes, and social clubs. Encouragement and opportunity for study. Salary and conditions Whitley Council. Single accommodation available. Married accommodation a possibility.

Applications, with names of 3 referees, to Physician-Superintendent within 14 days.

GRANTHAM AND KESTEVEN GENERAL HOSPITAL. (118 Beds. Recognised for training for F.R.C.S.) SHEFFIELD REGIONAL HOSPITAL BOARD. SECOND RESIDENT SURGICAL OFFICER with duties in orthopædics, gynæcology, E.N.T. and relief duties for Resident Surgical Officer required at Registrar rate of pay. Appointment for 1 year in first instance.

Apply to Secretary, Sheffield Regional Hospital Board, Old Fulwood-road, Sheffield, by 22nd October, 1956, giving age, nationality, qualifications, present and previous appointments with dates, naming 3 referees.

GUILDFORD. ST. LUKE'S HOSPITAL. Guildford Group HOSPITAL MANAGEMENT COMMITTEE. SOUTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD. Applications are invited for the post of REGISTRAR (obstetrics and gynæcology), 1 of 2. Post offers extensive experience in obstetrics and gynæcology. Possession of higher qualification an advantage. Appointment is for 1 year only without renewal. Unit is recognised for M.R.C.O.G.

Application forms from Secretary, Guildford Group Hospital Management Committee, St. Luke's Hospital, Guildford, to whom they should be returned by 26th October, 1956.

HITCHIN, HERTFORDSHIRE. LISTER HOSPITAL. Applications are invited for RESIDENT CASUALTY OFFICER for duty with Accident Service, with care of traumatic and orthopædic inpatients. The post is recognised for F.R.C.S., and becomes vacant on 1st November, 1956. Salary £745–£1075 according to experience.

Applications, stating age, nationality, qualifications and experience together with copies of 3 recent testimonials, to be sent to Medical Administrator as soon as possible.

HITCHIN, HERTFORDSHIRE. NORTH HERTS HOSPITAL. Applications are invited for the post of RESIDENT HOUSE SURGEON, vacant 3rd November, 1956. Recognised as pre-registration post.

Applications, stating age, nationality, qualifications and experience, together with copies of 3 recent testimonials, to be sent to the Medical Administrator, Lister Hospital, Hitchin, as soon as possible.

HULL A GROUP HOSPITAL MANAGEMENT COMMITTEE. SENIOR HOUSE OFFICER required in the E.N.T. Departments of the Victoria Hospital for Sick Children, and the Hull Royal Infirmary. This post is recognised for the F.R.C.S. and D.L.O.

Applications, with testimonials, should be sent to the Hospital Secretary, Victoria Hospital for Sick Children, Park-street, Hull.

HUDDERSFIELD ROYAL INFIRMARY. (312 Beds.) HOUSE SURGEON required to commence duties on 14th November. The post is recognised as a pre-registration appointment and for the F.R.C.S. Salary in accordance with national scale.

Applications, together with copies of 3 recent testimonials, to be addressed to the undersigned as soon as possible.

H. J. JOHNSON, Secretary to the Management Committee.
Huddersfield Hospital Management Committee,
The Royal Infirmary, Huddersfield.

HEMEL HEMPSTEAD. ST. PAUL'S AND WEST HERTS HOSPITALS. NORTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD. REGISTRAR in Pathology required at above Hospitals. Post vacant immediately. Hospitals may be visited by direct appointment.

Application form obtainable from, and returnable to, the Secretary, West Herts Group Hospital Management Committee, 9, Rickmansworth-road, Watford, Herts, by not later than 10 days after the appearance of this advertisement.

HEMEL HEMPSTEAD, HERTFORDSHIRE. WEST HERTS HOSPITAL. (167 Beds.) Applications are invited for the post of HOUSE SURGEON at the above Hospital. (New post.)

Applications, stating full details and giving 2 names for reference, should be sent to the Hospital Secretary.

HAREFIELD HOSPITAL. REGIONAL THORACIC SURGICAL UNIT. NORTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD. Applications are invited for the posts of 2 SURGICAL REGISTRARS to the Harefield Thoracic Surgical Unit which serves the North West Metropolitan Region. In the Hospital there are 90 Beds for non-tuberculous surgical chest conditions and 446 Beds for tuberculosis. The appointments thus afford a wide experience in all aspects of thoracic surgery. Candidates must have had previous surgical experience and preference will be given to candidates with a higher surgical qualification. The appointments will be held in the first instance for 1 year.

Application forms obtainable from, and returnable to, the Secretary, Harefield and Northwood Group Hospital Management Committee, Mount Vernon Hospital, Northwood, Middlesex, by 30th October, 1956.

IPSWICH AND EAST SUFFOLK HOSPITAL. Heath ROAD WING, IPSWICH. (274 Beds.) Applications invited for 2 posts of HOUSE SURGEON (pre-registration) to General Surgeons. Posts become vacant 13th and 22nd November, 1956. Recognised for R.C.S. examinations.

Applications, with full details and copies of recent testimonials, to Hospital Secretary.

IPSWICH AND EAST SUFFOLK HOSPITAL. Heath ROAD WING, IPSWICH. (274 Beds.) Applications are invited for the post of HOUSE PHYSICIAN (pre-registration), vacant on 16th November, 1956.

Applications, giving details of qualifications, age, nationality, &c., together with copies of 3 recent testimonials, to the Hospital Secretary.

ISLEWORTH, MIDDLESEX. WEST MIDDLESEX HOSPITAL. NORTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD. SENIOR REGISTRAR (E.N.T. Department) required at above Hospital. Whole-time, non-resident. Hospital may be visited by direct appointment.

Application forms obtainable from, and returnable to, Group Secretary, South West Middlesex Hospital Management Committee, West Middlesex Hospital, Isleworth, Middlesex, by 23rd October, 1956.

KETTERING GENERAL HOSPITAL, Kettering. (170 Beds.) Applications are invited from registered medical practitioners for the appointment of SENIOR HOUSE OFFICER in Anæsthetics. Post recognised for D.A.

Applications, giving details of qualifications and experience, and enclosing copies of 3 recent testimonials, to be sent to the Group Secretary, Kettering and District Hospital Management Committee, at the above address.

LANCASTER AND KENDAL HOSPITAL MANAGEMENT COMMITTEE. Whole-time REGISTRAR (pathology), non-resident. Main duties at Central Laboratory, Royal Lancaster Infirmary. Appointment for 1 year in the first instance.

Applications, stating age, qualifications and previous experience, together with names of 3 referees, to Group Secretary, Lancaster and Kendal Hospital Management Committee, Royal Lancaster Infirmary, Lancaster.

LEAMINGTON SPA. WARNEFORD GENERAL HOSPITAL. (197 Beds.) HOUSE PHYSICIAN (pre-registration). Post vacant 23rd November.

Applications, with names of 2 recent referees, to be sent to Hospital Secretary.

LEICESTER ISOLATION HOSPITAL AND CHEST UNIT, Groby-road, LEICESTER. (328 Beds.) SHEFFIELD REGIONAL HOSPITAL BOARD. Whole-time RESIDENT REGISTRAR (chest and infectious diseases) required. Single accommodation available. This Hospital is also a Thoracic Surgical Centre. Appointment for 1 year in first instance.

Apply to Secretary, Sheffield Regional Hospital Board, Old Fulwood-road, Sheffield, by 22nd October, 1956, giving age, nationality, qualifications, present and previous appointments with dates, naming 3 referees.

LEEDS (near). MENSTON (MENTAL) HOSPITAL. Applications invited for whole-time appointments (*a*) SENIOR HOUSE OFFICER, (*b*) JUNIOR HOSPITAL MEDICAL OFFICER. Facilities available for training in all branches of psychiatry in conjunction with Department of Psychiatry, Leeds University. Salaries in accordance with terms and conditions of service of hospital medical and dental staffs. Residential accommodation for single persons. No house or flat available.

Applications to Physician-Superintendent, stating age, civil state, qualifications, experience, and names and addresses of 2 referees.

LEEDS REGIONAL HOSPITAL BOARD. Registrar vacancies.

Anæsthetics

(i) Huddersfield Group (approximately 225 Beds in the surgical specialties). Non-resident.

(ii) Mainly at Harrogate General Hospital (approximately 150 Beds in surgical specialties). Preferably resident. Recognised for the F.F.A.R.C.S.

Infectious Diseases

Castle Hill Hospital, Cottingham (167 infectious diseases beds). Resident.

General Surgery

Halifax Group. 1 of 3 similar posts. Duties divided approximately between general and orthopædic surgery (195 general surgical and 85 orthopædic beds). May include some duties in the Casualty Department. Preferably resident.

Applications, stating age, qualifications and details of present and previous appointments with dates, together with the names and addresses of 3 referees, to the Secretary, Joint Registrars Committee, Park-parade, Harrogate, by 25th October, 1956.

LEEDS REGIONAL HOSPITAL BOARD (in association with the Leeds Medical School) invites applications from fully Registered Practitioners for admission to the Regional Pathological Training Scheme. The scheme involves 4 years training, 2 as Senior House Officer and 2 as Registrar, and subject to satisfactory progress, the appointments are renewed annually.

Applications, stating age, qualifications, and details of present and previous appointments with dates, together with the names and addresses of 3 referees, should be forwarded to the Secretary, Park-parade, Harrogate, by not later than 19th October, from whom further details may be obtained on request.

LEEDS. UNITED LEEDS HOSPITALS. General INFIRMARY AT LEEDS. REGISTRAR in Psychiatry required. Non-resident post with opportunities for further training in psychiatry. Work carried out in conjunction with the University Professorial Department of Psychiatry.

Applications, stating age, qualifications and present and previous appointments with dates, with names of 3 referees, should be sent to the Sub-Dean, School of Medicine, Leeds, 2, not later than 16th October, 1956.

LEEDS. THE UNITED LEEDS HOSPITALS. The GENERAL INFIRMARY AT LEEDS. RESIDENT RADIOTHERAPY OFFICER (Senior House Officer status). The appointment is for a period of 6 months in the first instance, commencing 1st November, 1956. The post affords facilities for training for D.M.R.T. Conditions of service for hospital medical staff apply.

Applications, stating age, qualifications, previous posts with dates, and 3 names for reference, should be sent to the Secretary to the Board as soon as possible.

LICHFIELD (near). ST. MATTHEW'S HOSPITAL, BURNTWOOD, LICHFIELD. (1350 mental beds.) BURTON-ON-TRENT HOSPITAL MANAGEMENT COMMITTEE. JUNIOR HOSPITAL MEDICAL OFFICER (psychiatry) required. Resident accommodation available. Facilities for taking a D.P.M. Course at Birmingham University.

Applications, with names of 2 referees, to Medical Superintendent.

LINCOLN. LAWN HOSPITAL, Union-road. (Mental Hospital for Private Patients—160 Beds.) LINCOLN NO. 2 HOSPITAL MANAGEMENT COMMITTEE. JUNIOR HOSPITAL MEDICAL OFFICER required to commence duties at beginning of January, 1957. All modern treatments used at this active Hospital. Pleasant flat available.

Apply to the Medical Superintendent with copies of 3 testimonials.

LIVERPOOL, 6. NEWSHAM GENERAL HOSPITAL. Applications are invited for the appointment of HOUSE PHYSICIAN (pre-registration) or SENIOR HOUSE OFFICER. Grading according to qualifications and experience. Resident or non-resident, vacant immediately.

Apply to the Physician-Superintendent at the Hospital.

LIVERPOOL. THE UNITED LIVERPOOL HOSPITALS. Applications are invited for 2 posts of REGISTRAR in Orthopædics for the period 1st January–31st December, 1957. Annual reappointment thereafter until completion of the normal period of training will be considered without need for further application.

Apply by 27th October, 1956, on form obtainable from the Secretary, 80, Rodney-street, Liverpool, 1.

LUTON, BEDFORDSHIRE. ST. MARY'S HOSPITAL. SENIOR HOUSE OFFICER (resident) required 17th October, 1956. (129 Beds mainly for Chronic Sick and 33 Beds for Chest Diseases.)

Applications, stating age, nationality, qualifications, and experience, together with copies of 3 recent testimonials, to be sent to the Secretary, Luton and Hitchin Hospital Management Committee, St. Mary's Hospital, Luton, as soon as possible.

MAIDENHEAD HOSPITAL, St. Luke's-road, Maidenhead. Applications are invited for the post of CLINICAL ASSISTANT in Ophthalmology, involving 1 half-day per week on a Tuesday morning. Recent experience in ophthalmology desirable. Salary £175 p.a. per weekly half-day.

Application forms obtainable from, and returnable to, Group Secretary, Windsor Group Hospital Management Committee, Alma-road, Windsor, by 19th October.

MARKET DRAYTON (near), SHROPSHIRE. CHESHIRE JOINT SANATORIUM. (305 Beds.) RESIDENT MEDICAL OFFICER (Junior Hospital Medical Officer or Senior House Officer according to experience). The post offers exceptional experience in the treatment of pulmonary tuberculosis.

Applications to the Medical Superintendent at the Sanatorium.

MANCHESTER (near). ASTLEY HOSPITAL. (146 Beds.) SENIOR HOUSE PHYSICIAN, vacant 16th November, for general hospital with acute medical beds, a geriatric unit and infectious disease cases. Outpatient work at Leigh Infirmary. Applicants studying for higher qualifications preferred.

Full details to Secretary, Wigan and Leigh Hospital Management Committee, Knowsley House, Wigan.

MANCHESTER. BOOTH HALL AND MONSALL HOS-PITAL MANAGEMENT COMMITTEE. SENIOR HOUSE OFFICER (pathology), resident, required to assist the Director of Pathology for the Group (Booth Hall Children's Hospital and Monsall Hospital). Salary £745 p.a., less £150 p.a. for residence. Post tenable for 1 year in the first instance.

Applications to be sent as soon as possible to the Group Secretary, Booth Hall Hospital, Manchester, 9.

MANCHESTER, 20. WITHINGTON HOSPITAL. South MANCHESTER HOSPITAL MANAGEMENT COMMITTEE. Applications are invited for the post of SENIOR HOUSE OFFICER (surgical) including casualty duties vacant immediately. The post is recognised by the Royal College of Surgeons for the Final F.R.C.S. examination and possession of the primary F.R.C.S. will be an advantage. The Hospital is recognised by the Manchester University for the teaching of undergraduate students.

Applications, with full details, to the Group Secretary, Withington Hospital, within 7 days of the appearance of this advertisement.

MANCHESTER NORTHERN HOSPITAL. Applications are invited for the resident post of SENIOR HOUSE OFFICER in Gynæcology. Recognised for M.R.C.O.G. Vacant 2nd December, 1956.

Applications, with names of 2 referees, by 22nd October, 1956, to Group Secretary, North Manchester Hospital Management Committee, Crumpsall Hospital, Manchester.

MANCHESTER REGIONAL HOSPITAL BOARD invite applications for the post of REGISTRAR in Orthopædic Surgery, to the Blackpool and Fylde Group of hospitals, with main duties at Victoria Hospital, Blackpool. Furnished flat in married quarters available. Post recognised for F.R.C.S examination and vacant immediately.

Applications, stating age, qualifications and experience and the names and addresses of 2 referees, should be sent to the Group Secretary, Blackpool and Fylde Hospital Management Committee, Victoria Hospital, Blackpool.

MANCHESTER REGIONAL HOSPITAL BOARD. 2 posts of SENIOR REGISTRAR in Radiology as follows :—

(*a*) South Manchester Group of hospitals, mainly at Withington Hospital.

(*b*) Salford Group of hospitals, mainly at Salford Royal and at Hope and Royal Manchester Children's Hospitals.

Arrangements may later be made for the persons appointed to transfer to the United Manchester Hospitals for further experience and training.

Application forms, obtainable from the Senior Administrative Medical Officer of the Board, Cheetwood-road, Manchester, 8, should be returned by 29th October, 1956.

MANCHESTER REGIONAL HOSPITAL BOARD. Resi-DENT SURGICAL REGISTRAR required in the Blackburn and District Group with duties mainly at Queen's Park Hospital, Blackburn (640 mainly general beds). Post recognised for F.R.C.S.

Application forms obtainable from the Secretary to the Committee, Royal Infirmary, Blackburn, Lancs.

MANCHESTER REGIONAL HOSPITAL BOARD. Royal MANCHESTER CHILDREN'S HOSPITAL. SALFORD HOSPITAL MANAGEMENT COMMITTEE. Applications are invited for the post of RESIDENT SURGICAL OFFICER (Registrar grade), falling vacant 21st November, 1956. Previous experience in surgery essential. The Hospital is the chief teaching unit of the University Department of Child Health and the post gives ample opportunity for experience in all branches of surgery in children.

Applications, stating age, nationality and experience, together with names of 2 referees, to be forwarded to the Group Secretary, Salford Royal Hospital, Chapel-street, Salford, 3, to be received not later than 20th October, 1956.

MANCHESTER REGIONAL HOSPITAL BOARD. South MANCHESTER HOSPITAL MANAGEMENT COMMITTEE. Applications are invited from registered medical practitioners for the post of REGISTRAR in Radiotherapy at the Christie Hospital and Holt Radium Institute, Manchester. Candidates must hold either the Diploma in Radiotherapy or an F.R.C.S. or M.R.C.P. If the latter they would be eligible for Diploma in Radiotherapy Course commencing in April, 1957.

Applications, with full details, to be forwarded to the Group Secretary, Withington Hospital, Manchester, 20, immediately.

MANCHESTER. UNITED MANCHESTER HOSPITALS. MANCHESTER ROYAL INFIRMARY, MANCHESTER, 13. REGISTRAR to Department of Anæsthetics, to commence as soon as possible. Whole-time non-resident post, tenable for 12 months, renewable.

Application form obtainable from the undersigned, to be returned not later than 27th October, 1956.

G. H. TAYLOR, Secretary.

MANCHESTER. UNITED MANCHESTER HOSPITALS. MANCHESTER ROYAL INFIRMARY, MANCHESTER, 13. REGISTRAR to the Department of Cardiology, to commence on 4th January, 1957. Whole-time non-resident post, tenable for 1 year, renewable for a further year.

Application form obtainable from the undersigned, to be returned not later than 27th October, 1956.

G. H. TAYLOR, Secretary.

MANCHESTER. UNITED MANCHESTER HOSPITALS. MANCHESTER ROYAL EYE HOSPITAL. Applications are invited for the following posts :—

SENIOR HOUSE OFFICER.

HOUSE OFFICER (pre-registration surgical post).

Application forms may be obtained from the undersigned.

H. R. NORTH, General Superintendent.

Manchester Royal Eye Hospital.

MANCHESTER. UNITED MANCHESTER HOSPITALS. SAINT MARY'S HOSPITALS, MANCHESTER. Applications are invited for the post of REGISTRAR in the Neonatal Unit of Saint Mary's Hospitals (attached to the University Department of Child Health). The post is full time and resident and vacant 1st January, 1957. It is preferable but not essential that candidates should hold a higher qualification. Previous experience in pædiatrics essential. The post is tenable for 12 months and the salary is in accordance with the national scale.

Application forms may be obtained from the undersigned and should be completed and returned by 29th October, 1956.

A. R. WISE, General Superintendent.

Saint Mary's Hospitals, Whitworth Park, Manchester, 13.

MANCHESTER. WEST MANCHESTER HOSPITAL MANAGEMENT COMMITTEE. PARK HOSPITAL, DAVYHULME. (General Hospital—433 Beds.) HOUSE PHYSICIAN (pædiatrics) required for mid-November. Post-registration. There is a Midwifery Unit of 73 Beds and a Pædiatric Unit which includes 10 thoracic surgical beds. Recognised for D.C.H.

Application forms from Secretary.

MANCHESTER. WEST MANCHESTER HOSPITAL MANAGEMENT COMMITTEE. PARK HOSPITAL, DAVYHULME. (General Hospital—433 Beds.) SENIOR HOUSE OFFICER (general surgery) required. Post vacant end-November.

Application forms from Secretary.

MANCHESTER. WEST MANCHESTER HOSPITAL MANAGEMENT COMMITTEE. PARK HOSPITAL, DAVYHULME. Applications are invited from suitably qualified and experienced Male or Female candidates for RESIDENT SURGICAL REGISTRAR (Thoracic Unit). This Hospital is a General Hospital of 433 Beds. It carries out by far the major part of the Manchester Region's cardiac and non-tuberculous thoracic surgery, in addition to all other major specialties. The total number of resident medical staff is 20. The successful candidate will be expected to work with each of the 3 Consultant Thoracic Surgeons attached to this unit of 50 Beds (including 10 children's beds).

Application forms from the Secretary.

MANCHESTER. WEST MANCHESTER HOSPITAL MANAGEMENT COMMITTEE. PARK HOSPITAL, DAVYHULME. (General Hospital—433 Beds.) SENIOR HOUSE OFFICER (non-tuberculous Thoracic Surgery) required for Manchester Regional Hospital Board Centre. Post now vacant.

Application forms from Secretary.

MIDDLESBROUGH. ST. LUKE'S HOSPITAL. St. Luke's HOSPITAL MANAGEMENT COMMITTEE. Applications are invited for the post of JUNIOR HOSPITAL MEDICAL OFFICER (resident). Salary scale £775–£50–£1075 p.a. Flat (furnished or unfurnished) available. The post in the first instance will be tenable for a period of 4 years and is renewable. Facilities for all forms of psychiatric work are available and a Regional Training Scheme leading to the D.P.M. (Durham) is in operation. Previous experience of psychiatric work is not essential.

Applications, stating age, qualifications and appointments held, also the names of 3 referees, should be addressed to the Physician-Superintendent at the Hospital.

MORPETH, NORTHUMBERLAND. NORTHGATE AND DISTRICT HOSPITAL. JUNIOR HOSPITAL MEDICAL OFFICER. The Hospital consists of 4 units with a total of 638 Beds for mental defectives of all ages and grades. A modern flat is available at a reasonable rental or furnished single accommodation. Salary and conditions in accordance with national scale. Facilities for study.

Applications, stating age, qualifications, experience, and names of 2 referees, to the Medical Superintendent.

NEWCASTLE GENERAL HOSPITAL. Newcastle upon TYNE HOSPITAL MANAGEMENT COMMITTEE. DEPARTMENT OF NEUROLOGICAL SURGERY. The resident post of HOUSE OFFICER is now vacant, tenable for 6 months. Pre-registration appointment.

Applications, together with the names and addresses of 2 referees, should be sent to the Secretary, Newcastle General Hospital, Westgate-road, Newcastle upon Tyne, 4.

NEWCASTLE. THE UNITED NEWCASTLE UPON TYNE HOSPITALS. Applications are invited for the whole-time non-resident appointment of SENIOR MEDICAL REGISTRAR in the first year tenable at the Royal Victoria Infirmary. The appointment is for 1 year in the first instance, and may be renewed to a maximum of 4 years. The appointment will be subject to terms and conditions of service of hospital medical staff in the National Health Service. In any reappointment the successful candidate may be required to undertake duty in a hospital under the Newcastle Regional Hospital Board.

Applications, giving full details, and the names and addresses of 3 referees, should be sent to the undersigned within 2 weeks of the appearance of this advertisement.

A. W. SANDERSON, House Governor and Secretary.
Royal Victoria Infirmary, Newcastle upon Tyne.

NEWPORT, I. W. ST. MARY'S HOSPITAL. (345 Beds.) ISLE OF WIGHT GROUP HOSPITAL MANAGEMENT COMMITTEE. SENIOR HOUSE OFFICER required as Casualty Officer and House Officer to Consultant Obstetrician and Gynæcologist, vacant November. Salary £745, less residential charge. Modern flat available for married candidate. Post recognised for F.R.C.S.

Applications, with names of 2 referees, to Hospital Secretary immediately.

NEWTON ABBOT HOSPITAL. (General Section—65 Beds.) RESIDENT SENIOR HOUSE SURGEON (Male or Female) required early December, 1956. Married quarters available.

Applications (quoting ref. F.364/37), stating qualifications, nationality, age, with copy testimonials, to be sent to the Group Secretary, Torquay District Hospital Management Committee, Torbay Hospital, Torquay, S. Devon.

NOTTINGHAM AND MIDLAND EYE INFIRMARY. Required SENIOR HOUSE OFFICER, duties to commence on 1st November, 1956. Salary and conditions of service in accordance with Ministry regulations. A furnished flat is available for married candidates, if required.

Applications, stating age, qualifications, and experience, together with copies of testimonials, to be sent to the Group Secretary, General Hospital, Nottingham.

OXFORD REGIONAL HOSPITAL BOARD. Registrar in Thoracic Surgery at Peppard Chest Hospital, near Reading (236 Beds, including 60 for surgical cases). The special Surgical Unit contains 34 Beds. Married or single accommodation available. Post available from 1st October, 1956, for an initial period of 1 year.

Application forms obtainable from the Secretary, Registrar Committee, 43, Banbury-road, Oxford, should reach him by 22nd October, 1956.

OXFORD. UNITED OXFORD HOSPITALS. Applications are invited for 2 posts of RESIDENT JUNIOR PATHOLOGISTS for 6 months ; 1 at the Churchill Hospital and 1 at the Radcliffe Infirmary, Oxford. The posts are graded at Senior House Officer rate, £745 p.a., and are vacant on 1st December.

Applications, stating age, qualifications, and experience, together with the names of 2 referees, to the Administrator, Radcliffe Infirmary, Oxford, should be received not later than 31st October.

PLYMOUTH. SOUTH DEVON AND EAST CORNWALL HOSPITAL.

SENIOR HOUSE OFFICER in Surgery, vacant 15th November, 1956. Recognised for the F.R.C.S. Devonport Section.

HOUSE SURGEON (pre-registration post), vacant 1st January, 1957. Recognised for the F.R.C.S. Freedom Fields Section.

HOUSE PHYSICIANS (pre-registration posts), vacancies 1st and 17th January, 1957. Greenbank Road Section.

HOUSE SURGEONS (pre-registration posts), vacancies 1st December, 1956, 10th and 18th January, 1957. Recognised for the F.R.C.S. Greenbank Road Section.

Applications, stating age, nationality, qualifications and experience, together with the names and addresses of 3 referees, to be sent to—

ARTHUR R. CASH, Group Secretary, Plymouth,
South Devon and East Cornwall General Hospital Group.
7, Nelson-gardens, Stoke, Plymouth.

PLYMOUTH. SOUTH DEVON AND EAST CORNWALL HOSPITAL. CENTRAL CASUALTY DEPARTMENT. SENIOR HOUSE OFFICERS in Casualty, 2 vacancies on 1st January, 1957. Recognised for the F.R.C.S.

Applications, stating age, nationality, qualifications and experience, with names of 3 referees, to be sent to—

ARTHUR R. CASH, Group Secretary, Plymouth,
South Devon and East Cornwall General Hospital Group.
7, Nelson-gardens, Stoke, Plymouth.

PONTEFRACT. HEADLANDS HOSPITAL. House PHYSICIAN (Senior House Officer grade) required to fill a post at above Hospital. Married accommodation available. This is a modern Geriatric Unit of 215 Beds.

Applications as soon as possible to—

D. G. DAVIES, Group Secretary,
Pontefract and Castleford Hospital Management Committee.
Great Northern House, Salter-row, Pontefract, Yorks.

PORTSMOUTH GROUP HOSPITAL MANAGEMENT COMMITTEE.

Royal Portsmouth Hospital

SENIOR HOUSE SURGEON. Recognised for the F.R.C.S. Vacant now.

Applications, stating age, experience, and qualifications, together with names of 2 referees, should be forwarded as soon as possible to E. H. HURST.

St. Mary's Hospital, Milton-road, Portsmouth.

READING AREA HOSPITALS. Applications are invited for the post of SENIOR HOUSE OFFICER (pathology). Previous experience in pathology desirable, but not essential. Salary £745, less £150 board-residence.

Apply, stating age, qualifications with dates, nationality, present post, together with the names of 3 referees, to Group Secretary, 3, Craven-road, Reading.

READING. BATTLE HOSPITAL. (391 Beds.) Applica- tions are invited from registered medical practitioners for the post of RESIDENT JUNIOR HOUSE SURGEON in the Area Accident and Orthopædic Department. Post now vacant F.R.C.S. recognised. Also casualty duties. Salary £425–£525 p.a., less £125 board-residence.

Apply, stating age, qualifications with dates, nationality, present post, with 1 copy of recent testimonial, to Hospital Secretary.

REDHILL COUNTY HOSPITAL, Earlswood Common, REDHILL, SURREY. RESIDENT HOUSE SURGEONS (2 pre-registration posts), vacant mid-November, recognised for F.R.C.S. Likelihood of House Physician appointment to follow.

Apply Group Secretary, Redhill Group Hospital Management Committee, "Earlswood Mount," Pendleton-road, Redhill, Surrey (Redhill 3581, Ex. 20).

REDHILL COUNTY HOSPITAL, Earlswood Common, REDHILL, SURREY. SOUTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD. ANÆSTHETIC REGISTRAR. Resident appointment, married quarters available. Recognised for D.A. Applicants should state whether available for locum pending making of formal appointment.

Forms from Secretary, Redhill Group Hospital Management Committee, Earlswood Mount, Pendleton-road, Redhill, Surrey.

ROCHDALE AND DISTRICT HOSPITAL MANAGE- MENT COMMITTEE. BIRCH HILL HOSPITAL. SENIOR HOUSE OFFICER (obstetrics and gynæcology) required. The post is for 12 months in the first instance and is recognised for the D.Obst.R.C.O.G.

Apply to the Group Secretary, Central Offices, Birch Hill Hospital, Rochdale.

ROMFORD, ESSEX. RUSH GREEN HOSPITAL. (301 Beds.) SENIOR HOUSE OFFICER (Male or Female) required from 14th November, 1956. Duties include work in general medicine and in the Regional Poliomyelitis Unit (30 Beds), where excellent experience of modern methods can be obtained. Resident post.

Applications to Medical Superintendent.

ROMFORD, ESSEX. VICTORIA HOSPITAL. (99 Beds.) RESIDENT HOUSE PHYSICIAN (Male) required immediately. Post not approved for pre-registration purposes.

Applications should be forwarded to the Secretary, Romford Group Hospital Management Committee, Oldchurch Hospital, Romford.

SHREWSBURY. ROYAL SALOP INFIRMARY. Ortho- PÆDIC/ACCIDENT HOUSE SURGEON (Senior House Officer). Successful applicant will be allowed to attend for 2 days a month at the Robert Jones and Agnes Hunt Orthopædic Hospital, Oswestry, for postgraduate study, with the Consultant. Post recognised under revised Fellowship regulations in respect of 6 months training required for the Final Fellowship examination. Vacant 1st November, 1956.

Applications, with copy testimonials, to Group Secretary, Shrewsbury Hospital Group, Royal Salop Infirmary, Shrewsbury.

SCARBOROUGH HOSPITAL. (General—190 Beds.) Applications are invited for the post of NON-RESIDENT CASUALTY OFFICER (Junior Hospital Medical Officer) to commence duty approximately 1st November, 1956. Terms and conditions of service in accordance with those prescribed for medical and dental staffs. A furnished cottage is available for the successful applicant in the grounds of Cross Lane Hospital (1 mile distant), for which the present rent is £7 19s. 9d. per month.

Applications, giving age, qualifications, details of present and previous appointments, and the names of 2 referees, should be forwarded to the Hospital Secretary.

SCOTLAND. SOUTH-EASTERN REGIONAL HOSPITAL BOARD. Applications are invited for 2 appointments of REGISTRAR at the Department of Psychological Medicine, Royal Hospital for Sick Children, Edinburgh. During the tenure of the post opportunities for interchange of duty and training at other centres in the Region may be available under the joint training scheme of the South-Eastern Regional Hospital Board and the Department of Psychological Medicine of the University of Edinburgh.

Applications, giving particulars of age, qualifications, and previous experience, together with the names of 2 referees, should be sent to the Secretary, South-Eastern Regional Hospital Board, Scotland, 11, Drumsheugh-gardens, Edinburgh, 3, by 3rd November.

SCOTLAND. EASTERN REGIONAL HOSPITAL BOARD. Chest Medicine and Tuberculosis. DUNDEE AREA. Applications are invited for the post of SENIOR REGISTRAR in Chest Medicine and Tuberculosis in the Dundee Area. Duties will be mainly at Ashludie Chest Hospital, Monifieth, near Dundee (222 Beds, including the Regional Thoracic Surgical Centre with 60 Beds), and the Chest Clinic in Dundee. Higher medical qualification desirable. Salary and conditions of service in accordance with national agreement.

Further particulars and forms of application from the Secretary to the Board, "Braeknowe," 430, Blackness-road, Dundee, with whom applications must be lodged not later than 27th October, 1956.

SCOTLAND. EASTERN REGIONAL HOSPITAL BOARD. Mental Deficiency. BALDOVAN INSTITUTION. Applications are invited for the post of SENIOR REGISTRAR at Baldovan (Mental Deficiency) Institution by Dundee. The present bed complement of 400 Beds is being developed to 750. It is a centre for a system of clinics for the mentally handicapped at Dundee, Perth, Arbroath and Montrose set up in operation with the Local Authorities. The Institution is associated with the Medical School in Dundee for purposes of undergraduate and postgraduate teaching. Salary and conditions of service in accordance with national agreement.

Forms of application and further particulars from the Secretary to the Board, 430, Blackness-road, Dundee, with whom applications must be lodged not later than 27th October, 1956.

SCOTLAND. WESTERN REGIONAL HOSPITAL BOARD. Applications are invited for the following appointments, which will be for 1 year in the first instance :—

SENIOR REGISTRAR in Pathology with primary duties in hæmatology and blood transfusion, based at Stobhill General Hospital, Glasgow.

SENIOR REGISTRAR in Medicine based at the Victoria Infirmary, Glasgow.

REGISTRAR in Pathology based at the Victoria Infirmary, Glasgow.

REGISTRAR in Surgery based at the Royal Alexandra Infirmary, Paisley.

These appointments are subject to the National Health Service (Scotland) superannuation regulations.

Applications (12 copies), stating date of birth, qualifications, experience, present appointment, and the names of 3 referees, to reach the Secretary, Western Regional Hospital Board, 64, West Regent-street, Glasgow, C.2, by 27th October, 1956.

SCUNTHORPE, LINCOLNSHIRE. WAR MEMORIAL HOSPITAL. (362 Beds.) Vacancy for HOUSE PHYSICIAN (1 of 2) pre-registration or Senior House Officer according to experience. Busy department with medicine, paediatrics, skins and eyes with busy outpatient clinics offering good experience.

Applications, naming 2 referees, to Group Secretary, Scunthorpe Hospital Management Committee.

SCUNTHORPE AND DISTRICT WAR MEMORIAL HOSPITAL. (267 Beds. Recognised for training for F.R.C.S.) SHEFFIELD REGIONAL HOSPITAL BOARD. Whole-time RESIDENT REGISTRAR (orthopædics) required. Appointment for 1 year in first instance.

Apply to Secretary, Sheffield Regional Hospital Board, Old Fulwood-road, Sheffield, by 22nd October, 1956, giving age, nationality, qualifications, present and previous appointments with dates, naming 3 referees.

SHEFFIELD. THE UNITED SHEFFIELD HOSPITALS. Applications invited for the following posts :—

(*a*) REGISTRAR in Thoracic Surgery at the Royal Infirmary Unit. Post vacant 15th December, 1956.

Closing date for applications 20th October, 1956.

(*b*) NON-RESIDENT REGISTRAR or SENIOR HOUSE OFFICER in Clinical Pathology. Grade according to qualifications and experience. The successful candidate may be required to work in any of the laboratories of The United Sheffield Hospitals.

Closing date for applications 27th October, 1956.

Applications should state, age, qualifications and experience, give the names of 3 referees, and be sent to the Chief Administrative Officer, The United Sheffield Hospitals, West-street, Sheffield, 1.

SLOUGH, BUCKINGHAMSHIRE. UPTON HOSPITAL. WINDSOR GROUP HOSPITAL MANAGEMENT COMMITTEE. Applications invited for post of HOUSE SURGEON (pre-registration post).

Applications, with names of 2 referees, to Secretary.

SOUTHEND-ON-SEA GENERAL HOSPITAL. Locum ANÆSTHETIC REGISTRAR required from 21st October, 1956, on a month to month basis for a period up to 6 months. Post recognised for F.F.A.R.C.S.

Applications, stating age, qualifications, &c., should be sent to the undersigned as soon as possible.

J. C. FIELD, Secretary.

SOUTH EAST METROPOLITAN REGIONAL HOSPITAL BOARD. Applications are invited for an appointment as Whole-time SENIOR REGISTRAR in Psychiatry to fill a vacancy in the approved trainee establishment at Hellingly Hospital, Hailsham, Sussex. Candidates should possess the D.P.M. and have had experience in general medicine. The appointment will be in accordance with the terms and conditions of service of hospital medical and dental staffs (England and Wales), and will be for 1 year in the first instance. The post will include opportunities for gaining further experience in a wide range of psychiatry including attendance at adult outpatient clinics. Accommodation is available for a married applicant.

Applications, giving particulars of age, qualifications and experience with relevant dates, together with the names and addresses of 3 referees, should be sent to the Secretary, Registrars Committee, South East Metropolitan Regional Hospital Board, 11, Portland-place, London, W.1, not later than 27th October, 1956.

SOUTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD. Psychiatric Registrars training scheme. Applications are invited for the appointment of REGISTRAR for 6-month periods at the hospitals of St. Ebba's, Horton, Long Grove and The Manor in succession. Wide experience is available in all forms of psychosis, in neurosis and in mental deficiency under modern methods of treatment. Special experience may be gained in the Mott Clinic for General Paralysis, St. Ebba's Juvenile Unit and in Mapother House, Long Grove, for acute psychosis ; also in the associated observation wards and Outpatient Departments. The appointment will be tenable from January, 1957. Salary, &c., in accordance with the agreed terms and conditions of service of hospital medical staff. For residents appropriate charges are made for full residential amenities. Candidates may visit the hospitals by appointment with the Physicians-Superintendent.

Application forms may be obtained from the Group Secretary, St. Ebba's and Belmont Group Hospital Management Committee, Group Office, Belmont Hospital, Brighton-road, Sutton, Surrey, and completed forms (5 copies) should be returned to him within 2 weeks of the appearance of this advertisement.

SOUTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD. Psychiatric Registrars Training Scheme. Applications are invited for the appointment of REGISTRAR for 6 months periods at the Hospitals—Knowle, Fareham ; Coldeast, Sarisbury, near Southampton ; St. James', Portsmouth and Moorgreen, Southampton, in succession. These appointments afford wide experience in the treatment of all forms of nervous and mental disorder, including cases admitted to the observation ward at Moorgreen Hospital, and in mental deficiency. In addition there are special opportunities for experience in the Department of Child Psychiatry (inpatients and outpatients), in electro-encephalography, and in neurology at St. James' Hospital. Salary, &c., in accordance with the agreed terms and conditions of service for hospital medical staff. For residents appropriate charges are made for full residential amenities. Candidates may visit the hospitals by appointment with the Physicians-Superintendent.

Applications to the Group Secretary, Knowle Hospital, Fareham, Hants, and 5 copies should be sent to him within 2 weeks of the appearance of this advertisement.

SOUTHAMPTON GROUP OF HOSPITALS. South WEST METROPOLITAN REGIONAL HOSPITAL BOARD. Applications are invited for the post of REGISTRAR in Chest Medicine to the above Group at the Southampton Chest Hospital and Central Chest Clinic, becoming vacant in December. Good experience in general medicine is desirable. Duties offer experience in all aspects of thoracic medicine.

Application forms may be obtained from the undersigned and should be returned not later than Saturday, 27th October, 1956.

FRANK JENNINGS, Group Secretary,
Southampton Group Hospital Management Committee.
Bullar-street, Southampton.

SOUTHAMPTON GENERAL HOSPITAL. (472 Beds.) RESIDENT HOUSE SURGEON required mid-November. Pre-registration candidates eligible.

Applications, with copies of recent testimonials, should be forwarded to Group Secretary, Southampton Group Hospital Management Committee, Bullar-street, Southampton.

SOUTHAMPTON. ROYAL SOUTH HANTS HOSPITAL. (278 Beds.) ORTHOPÆDIC HOUSE SURGEON required. Post recognised for Pre-registration Service and tenable for 6 months. The Hospital is the centre to which all trauma from a large industrial town and port is directed thus providing excellent experience in the treatment of traumatic conditions ; patients with orthopædic conditions are also drawn from a wide area.

Applications, with copies of testimonials, should be sent as soon as possible to the Group Secretary, Southampton Group Hospital Management Committee, Bullar-street, Southampton.

SOUTHAMPTON. ROYAL SOUTH HANTS HOSPITAL (274 Beds) and SOUTHAMPTON GENERAL HOSPITAL (472 Beds). SENIOR HOUSE OFFICER (E.N.T.) required beginning of October. This post is recognised for the F.R.C.S. (Eng.) and D.L.O. examinations and provides experience in all branches of E.N.T. work. The Group includes a diagnostic and distributing Hearing Aid Centre.

Applications, with copies of recent testimonials, should be forwarded as soon as possible, to the Secretary, Southampton Group Hospital Management Committee, Bullar-street, Southampton.

SOUTHAMPTON. ROYAL SOUTH HANTS HOSPITAL. (278 Beds.) RESIDENT HOUSE SURGEON required mid-November. Pre-registration candidates eligible.

Applications, with copies of recent testimonials, should be forwarded to Group Secretary, Southampton Group Hospital Management Committee, Bullar-street, Southampton.

STOKE-ON-TRENT. BUCKNALL HOSPITAL. (58 infectious, 20 pneumoconiosis, 124 chronic sick beds.) Applications invited for post of RESIDENT JUNIOR HOSPITAL MEDICAL OFFICER. Married accommodation available. The person appointed will be associated with all 3 departments of the Hospital and will be required to assist at the pneumoconiosis clinic.

Applications, with copy testimonials, to Group Secretary, Hospital Management Committee, Princes-road, Stoke-on-Trent.

STOKE-ON-TRENT. NORTH STAFFORDSHIRE ROYAL INFIRMARY. HOUSE OFFICER (general surgery) required. Pre-registration post. Hospital recognised for F.R.C.S.

Detailed applications, with copy testimonials, to Group Secretary, Hospital Management Committee, Princes-road, Stoke-on-Trent.

STOKE-ON-TRENT. NORTH STAFFORDSHIRE ROYAL INFIRMARY. HOUSE OFFICER (orthopædics) required. Recognised pre-registration post. Hospital recognised for F.R.C.S.

Applications, with copy testimonials, to Group Secretary, Hospital Management Committee, Princes-road, Stoke-on-Trent.

STOKE-ON-TRENT. CITY GENERAL HOSPITAL. Applications invited for HOUSE OFFICER (medical), vacant mid-October. Recognised pre-registration post.

Detailed applications to Group Secretary, Hospital Management Committee, Princes-road, Stoke-on-Trent.

STARCROSS, DEVON. ROYAL WESTERN COUNTIES INSTITUTION HOSPITAL GROUP. Applications are invited for the appointment of JUNIOR HOSPITAL MEDICAL OFFICER (Male or Female), preferably with some knowledge of mental deficiency.

Applications, with full details of age, qualifications, and experience, together with names of 2 referees, should be submitted to the Medical Superintendent, Royal Western Counties Institution, Starcross, Devon.

ST. ALBANS CITY HOSPITAL. (384 Beds.) **North West METROPOLITAN REGIONAL HOSPITAL BOARD.** CASUALTY OFFICER (Registrar grade) required. Post recognised for the F.R.C.S. regulations and preference will be given to such candidates. Appointment tenable for 6 months from middle of December, 1956, approximately, and subject to review at the end of this period.

Application forms obtainable from, and returnable to, Secretary, Mid Herts Group Hospital Management Committee, Bleak House, Catherine-street, St. Albans, Herts, by 22nd October, 1956.

ST. ALBANS CITY HOSPITAL. (384 Beds.) **North West METROPOLITAN REGIONAL HOSPITAL BOARD.** Whole-time MEDICAL REGISTRAR required. Post vacant 11th January, 1957. Preference given to candidates having considerable experience in dealing with medical emergencies. Hospital may be visited by direct appointment.

Application forms obtainable from, and returnable to, Secretary, Mid Herts Group Hospital Management Committee, Bleak House, Catherine-street, St. Albans, Herts, by 29th October, 1956.

ST. ALBANS CITY HOSPITAL, St. Albans, Hertfordshire. (384 Beds.) HOUSE PHYSICIAN (House Officer grade) required for 1 of the 2 medical teams for duties mainly on the acute wards. Post vacant 8th November and tenable for 6 months. Preference given to candidates seeking post under the Medical Act, 1950.

Applications to Secretary, Mid-Herts Group Hospital Management Committee, Bleak House, Catherine-street, St. Albans.

ST. ALBANS CITY HOSPITAL, St. Albans, Hertfordshire. (384 Beds.) HOUSE SURGEON (House Officer grade) required for general surgical team. Recognised for F.R.C.S. Post vacant 2nd November and tenable for 6 months. Preference given to candidates seeking post under the Medical Act, 1950.

Applications to Secretary, Mid-Herts Group Hospital Management Committee, Bleak House, Catherine-street, St. Albans.

ST. ALBANS (near), HERTFORDSHIRE. SHENLEY HOSPITAL. Applications are invited for the post of SENIOR HOUSE OFFICER (Psychiatrist), resident or non-resident, for 1 year in the first instance, at Shenley Hospital 16 miles from London. Opportunity for work with neurotic as well as psychotic patients, and full facilities for D.P.M. training. The Hospital may be visited by appointment.

Applications to the Medical Superintendent.

SUTTON AND CHEAM HOSPITAL, Cotswold-road, SUTTON, SURREY. RESIDENT SENIOR HOUSE OFFICER (Casualty Officer). Post recognised for F.R.C.S.

Applications, stating age, experience and qualifications, with copies of recent testimonials and the names of 2 referees, to the Group Secretary, St. Helier Hospital, Carshalton, Surrey.

SUTTON, SURREY. BANSTEAD HOSPITAL. (2400 Beds.) Applications are invited for the post of PSYCHIATRIC REGISTRAR at the above Hospital; which offers full facilities for training in psychiatry, including the special study of neuroses and child guidance. Courses in psychology are arranged for the D.P.M. An unfurnished flat is available for a married person. Accommodation also available for a single person at a moderate charge.

Candidates should apply to the Secretary, Banstead Hospital, Sutton, Surrey, for forms of application, which should be returned, duly completed, within 14 days of the appearance of this advertisement. Candidates may visit the Hospital by arrangement with the Physician-Superintendent.

SUTTON, SURREY. BANSTEAD HOSPITAL. Applications are invited for the post of JUNIOR HOSPITAL MEDICAL OFFICER at the above Hospital of 2400 Beds, which caters for all forms of nervous and mental disorders. The post offers an excellent opportunity for training in psychiatry and in particular in preparation for the D.P.M. for which courses of clinical instruction, including Psychology, are arranged. An unfurnished flat is available for a married person. Accommodation also available for a single person at a moderate charge.

Applicants should apply to the Secretary, Banstead Hospital, Sutton, Surrey, for form of application, which should be returned, duly completed, within 14 days of the appearance of this advertisement.

SWANSEA HOSPITAL, Swansea. (403 Beds.) **Glantawe HOSPITAL MANAGEMENT COMMITTEE.** Registered medical practitioners are invited to apply for the locum appointment of RESIDENT ANÆSTHETIST (Senior House Officer grade), at the above Hospital. The Hospital is recognised under the D.A. and F.F.A.R.C.S. regulations.

Applications, stating age, qualifications and experience, together with copies of 2 recent testimonials, should be forwarded to the Hospital Secretary. T. E. JONES, Group Secretary.

SOUTH CHESHIRE HOSPITAL MANAGEMENT COMMITTEE. SENIOR HOUSE OFFICER (anæsthetics), Male or Female. 6 months or 12 months as preferred. Approved for D.A. Duties chiefly at general hospital and Maternity Unit. Previous experience is not essential. Salary and conditions as per regulations.

Applications, stating age, details of experience, qualifications and names of 3 referees, immediately to Group Secretary, Barony Hospital, Nantwich.

TAUNTON AND SOMERSET HOSPITAL. Applications are invited for SENIOR HOUSE OFFICER (casualty and orthopædic), vacant from 9th December, 1956.

Applications, stating age, nationality and qualifications, together with the names of 2 referees, should be forwarded to the Group Secretary, Taunton Hospital Management Committee, Taunton and Somerset Hospital, Musgrove Park Branch, Taunton, Somerset.

TAUNTON AND SOMERSET HOSPITAL. Applications are invited for the post of HOUSE OFFICER (E.N.T.), vacant 5th November, 1956. Post-registration appointment, recognised for F.R.C.S. and D.L.O.

Applications, stating age, nationality and qualifications, together with the names of 2 referees, should be forwarded immediately to the Group Secretary, Taunton Hospital Management Committee, Taunton and Somerset Hospital, Musgrove Park Branch, Taunton, Somerset.

UXBRIDGE CHEST CLINIC, High-street, Uxbridge, MIDDLESEX. MEDICAL REGISTRAR required 1st January, 1957. Duties include clinical work, also supervision of patients at Hillingdon Hospital (30 Beds). Candidates require experience in general medicine and some experience in treatment of tuberculosis and diseases of chest. Further details from Physician-in-Charge. Clinic may be visited by direct appointment.

Application forms obtainable from, and returnable to, Group Secretary, Uxbridge Group Hospital Management Committee, The Furze, Pield Heath-road, Hillingdon, Middlesex, by 23rd October.

WATFORD. PEACE MEMORIAL AND SHRODELLS HOSPITALS. NORTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD. SURGICAL REGISTRAR required at the above Hospitals. Post vacant 10th November. Hospitals may be visited by direct appointment.

Application form obtainable from, and returnable to, the Secretary, West Herts Group Hospital Management Committee, 9, Rickmansworth-road, Watford, Herts, by not later than 10 days after appearance of this advertisement.

WELSH REGIONAL HOSPITAL BOARD. Registrar (general medicine), Merthyr General Hospital (120 Beds). Resident/non-resident. Subject to review end of first year.

Application forms from Senior Administrative Medical Officer, Temple of Peace, Cathays Park, Cardiff, within 14 days.

WESTON-SUPER-MARE GENERAL HOSPITAL. CASUALTY OFFICER (Senior House Officer grade) required 1st November, 1956, for the above Hospital. The appointment is recognised for F.R.C.S. examinations. An unfurnished flat is available for a married man.

Applications, stating age, qualifications and experience, together with the names and addresses of 2 referees, should be addressed to the Group Secretary, Weston-super-Mare Hospital Management Committee.

WARWICK (near). CENTRAL MENTAL HOSPITAL. (1400 Beds.) SENIOR HOUSE OFFICER (Neurosis Unit). Adult and child psychiatry clinics. Departments of Electro-encephalography, Occupational Therapy, Psychology and Social Work. Recognised for D.P.M. House available.

Applications, with names and addresses of 3 referees, to Medical Superintendent within 14 days.

WARRINGTON GENERAL HOSPITAL. (344 Beds.) Applications are invited for the post of SENIOR HOUSE OFFICER (pædiatrics), Male or Female, which will become vacant on 1st December, 1956. Post recognised for D.C.H. Scale of salary £745 p.a., less £150 for residential emoluments.

Applications to be forwarded to—

H. L. BOOT, Group Secretary,
Warrington and District Hospital Management Committee,
c/o General Hospital, Warrington, Lancs.

WAKEFIELD. STANLEY ROYD HOSPITAL. Applications invited for post of JUNIOR HOSPITAL MEDICAL OFFICER in Psychiatry. Salary scale £775–£50–£1075. Married accommodation may be available.

Address written applications, giving full personal particulars, details of training, experience, &c., together with 2 names and addresses for reference, to W. BOWRING, Group Secretary, Victoria Chambers, Wood-street, Wakefield.

WAKEFIELD. PINDERFIELDS GENERAL HOSPITAL. Applications invited for appointment of JUNIOR HOSPITAL MEDICAL OFFICER for the Leeds Regional Thoracic Centre (59 Beds) at Pinderfields General Hospital. The Centre deals with thoracic and upper abdominal surgery in association with the Thoracic Consultants of the General Infirmary at Leeds. Salary scale £775–£50–£1075 p.a., less a charge of £170 for board, lodging, &c. Married accommodation available.

Address written applications, with full particulars and 2 names and addresses for reference, to—

W. BOWRING, Group Secretary.

Victoria Chambers, Wood-street, Wakefield.

WHITEHAVEN HOSPITAL, Cumberland. (124 Beds and Annexe of 27 Beds.) HOUSE OFFICER (obstetrical and gynæcological). House Officer or Senior House Officer grade, vacant middle of November.

Detailed applications, with dates, and names of 2 referees, to the Group Secretary, Workington Infirmary, Cumberland.

WINCHESTER. ROYAL HAMPSHIRE COUNTY HOSPITAL. (313 Beds.) HOUSE SURGEON (gynæcology), recognised M.R.C.O.G., and HOUSE PHYSICIAN (obstetrics), recognised M.R.C.O.G. and D.Obst.R.C.O.G., required. Vacant 1st December and 30th November respectively.

Applications, with copies of 2 testimonials, to the Group Secretary.

WINCHESTER. ROYAL HAMPSHIRE COUNTY HOSPITAL. (313 Beds.) SENIOR HOUSE OFFICER (orthopædics) required. Post recognised F.R.C.S. Wide experience available under Area Orthopædic team. Appointment for 6 months in first instance. Vacant 4th November.

Applications, with copies of 2 testimonials, to the Group Secretary.

WINCHESTER. ROYAL HAMPSHIRE COUNTY HOSPITAL. (313 Beds.) HOUSE SURGEON (post recognised by Royal College of Surgeons) required for general surgery with some E.N.T. duties. Approved pre-registration post. Vacant 1st December.

Applications, with copies of 2 testimonials, to the Group Secretary.

WOLVERHAMPTON. THE ROYAL HOSPITAL. (An associated Hospital of the University of Birmingham Medical School.) SENIOR HOUSE OFFICER (anæsthetics), vacant 6th November. Appointment recognised for D.A. and F.F.A.R.C.S.

Apply Secretary with copies of testimonials.

WORCESTER ROYAL INFIRMARY. (213 Beds.) House SURGEON (pre-registration or otherwise) required middle November.

Applications to the Secretary.

YORK. NABURN AND BOOTHAM PARK HOSPITAL. YORK A AND TADCASTER HOSPITAL MANAGEMENT COMMITTEE. A vacancy exists for a JUNIOR HOSPITAL MEDICAL OFFICER in Psychiatry at this Hospital of 630 Beds with an annual admission-rate of over 550 (including Health Service, amenity and private categories). Preference will be given to applicants who wish to study for the D.P.M. and facilities for attending the appropriate courses at the University of Leeds are readily available. The Hospital has 2 branches, both undergoing structural and functional alterations and forming an integral part of the York Comprehensive Mental Health Service. The post may be resident or non-resident.

The Hospital may be seen by appointment with the Physician-Superintendent, Bootham Park, York, to whom applications should be addressed with details of career and the names of 3 referees.

Public Appointments

FACTORY DOCTORS. Factories Acts, 1937 and 1948. The following appointment as Appointed Factory Doctor is vacant. Apply to Chief Inspector of Factories, 19, St. James's-square, London, S.W.1.

District	*County*	*Latest date for receipt of applications*
WALLSEND	NORTHUMBERLAND	27TH OCTOBER, 1956

MUNICIPAL COUNCIL OF KITWE. Northern Rhodesia. Applications are invited from suitably qualified and experienced persons for the appointment of MEDICAL OFFICER OF HEALTH. The appointment attracts a salary of £1900–£100–£2300 plus cost-of-living allowance (at present 16% of basic salary), subsidised housing, generous leave and leave fares, superannuation and medical benefits. Candidates should state whether they are related to any Councillor or Officer of the Council. Canvassing directly or indirectly will disqualify.

Full particulars, including draft contract of service, obtainable from the undersigned or from The Commissioner for Northern Rhodesia, 57, Haymarket, London, S.W.1.

Applications in duplicate must be received by the undersigned by 15th December, 1956. S. W. COLEMAN, Town Clerk.

Municipal Offices, P.O. Box 70, Kitwe,
Northern Rhodesia, 1st October, 1956.

NORTHUMBERLAND COUNTY COUNCIL. Applications are invited from registered medical practitioners for the appointment of ASSISTANT COUNTY MEDICAL OFFICER to undertake duties primarily connected with maternal and child welfare. Salary scale £1050–£50–£1200–£55–£1475. Previous experience may be taken into consideration in determining the commencing salary. Travelling and subsistence allowances when applicable will be paid in accordance with the Council's scale. The appointment is subject to superannuation and will be determinable by 3 months notice on either side. The successful candidate will be required to pass a medical examination.

Forms of application and any further particulars required may be obtained from the County Medical Officer, County Hall, Newcastle upon Tyne, 1, and must be returned not later than 10th November, 1956.

BARROW-IN-FURNESS. COUNTY BOROUGH OF BARROW-IN-FURNESS. Applications are invited from registered medical practitioners holding the Diploma in Public Health or similar qualifications for the appointment of MEDICAL OFFICER OF HEALTH for the County Borough. The salary scale will be £1740–£55–£1960 p.a. in accordance with the recommendations of Medical Council Committee C of the Whitley Councils for the Health Services (Great Britain).

Form of application and conditions of appointment may be obtained from the undersigned, to whom applications in envelopes endorsed "Medical Officer of Health" should be sent, to be received not later than NOON on Wednesday, 31st October, 1956. LAWRENCE ALLEN, Town Clerk.

Town Hall, Barrow-in-Furness, September, 1956.

GOVERNMENT OF THE FEDERATION OF RHODESIA AND NYASALAND. MINISTRY OF HEALTH. Applications are invited for appointments as JUNIOR RESIDENT MEDICAL OFFICERS in the Government hospitals in the Federation.

The salaries applicable to these posts are :—

Southern Rhodesia : £40 per mensem plus free board, single quarters and laundry.

Northern Rhodesia : £52 1s. 8d. per mensem plus free single quarters (with essential furniture), but no board.

Application forms and further particulars may be obtained from the Public Service Attaché, Rhodesia House, 429, Strand, London, W.C.2. Closing date 10th November, 1956.

HER MAJESTY'S OVERSEA SERVICE. Kenya. Medical OFFICERS with qualifications registrable in United Kingdom required for general duties. Successful candidates may be posted to any station in Kenya. During earlier years of service an officer will be expected to carry out general medical and surgical duties including varying amount of public-health administration. In most stations, even if remote from the larger towns, it is possible to maintain interest in any particular branch of medicine or surgery, to which the officer is attracted. The work of every medical officer is based on a hospital which may vary in size and facilities from small district hospital, meeting needs of comparatively primitive community, to large and modern provincial hospital. Appointments can be made on permanent basis with pension (non-contributory), or on short-term contract with gratuity (taxable) payable on satisfactory completion of service. Normal retiring age is 55. Salary ranges from £1284 to £2115 a year, starting point determined by experience. 4 extra increments given to successful candidates possessing the F.R.C.S., M.R.C.P., D.P.H., or other approved higher qualifications. Permanent medical Officers are eligible to be considered at any time for promotion to super-scale posts in Kenya and other territories in medical administrations or, if they possess higher qualification and suitable experience, in specialist posts. Quarters at rental varying from £30 to £78 a year according to size and type, and furniture at rate varying from £15 to £36 a year. Free passages in both directions for Officer and wife and up to cost of 1 adult fare for children. Taxation at local rates. Annual local leave permissible and generous home leave granted after each tour of from 24 to 45 months. Educational facilities available.

Application forms from Director of Recruitment, Colonial Office, Great Smith-street, London, S.W.1 (quoting No. BCD. 117/7/02).

MINISTRY OF HEALTH. Senior Medical Officer (Pharmacologist). The Civil Service Commissioners invite applications from Men and Women for this permanent post in London. Age at least 28 on 1st September, 1956. Candidates must be registered medical practitioners with special knowledge of pharmacology. Duties concerned with administration of the Therapeutic Substances Act and Regulations controlling the manufacture for sale of biological products, and include advisory duties. Salary £2600. Non-contributory pension and gratuity.

Further information and application form from Secretary, Civil Service Commission, 6, Burlington-gardens, London, W.1, quoting 4631/56/7. Application forms should be returned by 31st October, 1956.

PROVINCE OF NEW BRUNSWICK, Canada. Vacancies for qualified PSYCHIATRISTS for full-time work in Psychiatric Hospitals and Clinics. Qualification : A Diploma in Psychological Medicine. Salary : minimum—$7170 p.a. ; maximum—$8118 p.a. ; annual increment $300 for satisfactory service. Full Civil Service benefits including 3 weeks annual vacation with pay, sick leave credits and superannuation. Part-time appointments are available which afford an opportunity for private consulting practice.

Further information may be obtained by writing to the Chairman, Civil Service Commission, P.O. Box 1055, Fredericton, New Brunswick, Canada, or the Director of Mental Health Services, Department of Health and Social Services, 658, Queen-street, Fredericton, New Brunswick, Canada.

PUBLIC SERVICE OF TASMANIA. Applications are invited for the position of PSYCHOLOGIST in the Mental Hygiene Division of the Department of Public Health at Hobart, Tasmania. The commencing salary will be in the range £A1402–£A1555 in accordance with qualifications and experience. The duties of the position include psychological testing under the direction of the Senior Psychologist and clinical psychology under psychiatric supervision. Work will be with adults and children, neurotics, psychotics, mental defectives, delinquents, &c., and will include work with Outpatient Clinics, Courts, Psychiatric Hospitals, &c. The required qualifications are : (*a*) University Degree with major in psychology; (*b*) Associateship of British Psychological Society, or eligibility for such ; and (*c*) at least five (5) years experience in the field of clinical psychology. An appointment will be made in accordance with the provisions of the Public Service Act.

Applications in duplicate, giving particulars of age, marital state, qualifications and experience, with references or names and addresses of referees, should reach the Agent-General for Tasmania not later than 31st October, 1956. Further particulars may be obtained from the Agent-General for Tasmania, 457, Strand, London, W.C.2.

THE MEDICAL SERVICE OF THE ROYAL NAVY

VACANCIES FOR MEDICAL OFFICERS

Candidates are invited for Short Service Commissions of 3 years, on termination of which a gratuity of £450 (tax free) is payable. Ample opportunity is granted for transfer to Permanent Commissions on completion of 1 year's total service. Officers so transferred are paid instead a grant of £1500 (taxable).

All entrants are required to be British subjects whose parents are British subjects, to be medically fit, and to pass an interview.

Full particulars from the Admiralty Medical Department, Queen Anne's Mansions, St. James's Park, London, S.W.1.

NOTTINGHAMSHIRE COUNTY COUNCIL. Hucknall URBAN DISTRICT COUNCIL. Applications are invited from registered medical practitioners for the mixed whole-time appointment of ASSISTANT COUNTY MEDICAL OFFICER AND MEDICAL OFFICER OF HEALTH to the Hucknall Urban District. Applicants must have had at least 3 years professional experience since qualifying, be experienced in the duties of Medical Officer of Health, School Medical Officer and the Care of Mothers and Young Children, and possess a Diploma in Public Health.

Salaries are in accordance with the recommendations of the Medical Whitley Council for Public Health Medical Officers holding mixed appointments, namely :—

(*a*) As Assistant County Medical Officer (32/44ths) £954 10s. 11d.–£43 15s. 0d.–£1173 5s. 11d. (on scale £1200–£55–£1475, plus loading in accordance with Spens Formula).

(*b*) As Medical Officer of Health (12/44ths) £501 16s. 4d.–£15–£561 16s. 4d. (on scale £1740–£55–£1960, plus 12/44ths of £100).

Application forms and conditions of appointment are obtainable from my office and applications should reach me by 3rd November, 1956. Canvassing disqualifies.

A. R. DAVIS, Clerk of the County Council.

Shire Hall, Nottingham.

STOKE-ON-TRENT. CITY OF STOKE-ON-TRENT EDUCATION COMMITTEE. Applications are invited for the post of DEPUTY PRINCIPAL SCHOOL MEDICAL OFFICER. Salary scale £1520–£1955 p.a. Consideration will be given to previous experience when fixing initial salary. Contributory superannuation. Candidates should have a Diploma in Public Health and considerable experience as a School Medical Officer. The appointment is terminable by 3 months notice on either side. The successful candidate will be required to pass a medical examination.

Application forms are obtainable from the undersigned, P.O. Box No. 23, Town Hall, Hanley, Stoke-on-Trent, to whom they should be returned as soon as possible.

H. DIBDEN, Chief Education Officer.

SURREY COUNTY COUNCIL. Wimbledon Borough COUNCIL. Applications invited for the mixed appointment of COUNTY DIVISIONAL (part) AND BOROUGH MEDICAL OFFICER OF HEALTH. Salary £1968 p.a., rising by annual increments to £2355 p.a. Commencing salary according to experience. Appointment subject to medical examination and to Local Government superannuation acts.

Applications, stating age, qualifications, and experience, with names of 3 referees, to Town Clerk, Town Hall, Wimbledon, S.W.19, by 19th October, 1956.

W. W. RUFF, Clerk of Surrey County Council.

FRANCIS J. O'DOWD, Town Clerk of Wimbledon.

YORKSHIRE. COUNTY COUNCIL OF THE WEST RIDING OF YORKSHIRE. Appointments of ASSISTANT COUNTY MEDICAL OFFICER AND SCHOOL MEDICAL OFFICER. Applications are invited from registered medical practitioners, Men or Women, for posts in the following areas :—

Division No. 5 : Pudsey M.B., Aireborough and Horsforth Urban Districts.

Division No. 17 : Spenborough M.B., and Mirfield Urban District. (2 vacancies.)

The Assistant will be on the staff of the County Medical Officer's Department but will work under the administrative direction of the Divisional Medical Officer for the area. The duties will be mainly clinical in the School Health and Infant Welfare Services, but other County health duties may be included by the Divisional Medical Officer. The scale of salary at present is £1050–£1475 p.a. A minimum of 3 years experience since qualification is desirable and the possession of a Diploma in Child Health will be an advantage. Travelling and subsistence allowances according to the County Council's scale are payable in addition to salary. The posts are superannuable and successful applicants will be required to pass a medical examination as to physical fitness.

Forms of application can be obtained from the undersigned, to whom they should be returned not later than 27th October, 1956.

J. WOOD-WILSON, County Medical Officer.

County Hall, Wakefield.

General Practice

For an Executive Council post (England and Wales) apply on form E.C.16A *obtainable from the council. Mark envelope "Vacancy."*

CASTLEFORD. Applications are invited for Vacancy in the Castleford Municipal Borough. List at present 1704. Present practitioner Female. Residence and surgery on rental expected to be available for successful applicant. Apply on Form E.C.16A to the undersigned, from whom further particulars may be obtained, not later than 27th October, 1956.

C. H. STABLER, Clerk of the West Riding Executive Council. 5, St. John's North, Wakefield.

SOUTH DEVON. Applications are invited for Vacancy (death) in a South Devon coastal town. List approximately 900. It is anticipated that premises will be available for purchase. Applications on Form E.C.16A should reach the undersigned not later than first post on Monday, 22nd October, 1956. Further details may be obtained on request.

H. BELL, Clerk, Devon and Exeter Executive Council. 46, Queen-street, Exeter.

Hospital Services : Non-Medical Appointments

U.S.A. LACONIA HOSPITAL, Laconia, New Hampshire, U.S.A. There is a vacancy for a TECHNICIAN with special experience in biochemistry. Laconia is a summer and winter resort in the lake district of New England.

For particulars apply to the Pathologist.

Miscellaneous

Anglican Medical Students' Association. St. Luke's Day, Thursday, 18th October, 1956, at St. George's, Bloomsbury Way, the University Church. 7.15, 8 A.M. and 12.15 P.M. Holy Communion. 6.30 P.M. Annual Service for Doctors and Medical Students. Preacher : The Right Revd. Joost de Blank, Bishop of Stepney.

Esso Petroleum Company Ltd. has a vacancy for an Industrial Hygiene Engineer in the Company's Medical Department. His function will be to investigate and advise on all health hazards arising from the Company's operations ; including the handling and use of products. Candidates should be between 25 and 35 years of age, and should hold a university degree in Chemical Engineering, Chemistry or similar field. Experience or training in Industrial Hygiene or Sanitary Engineering would be an added advantage.—Full details may be obtained from : The Personnel Manager, 16, Charles II-street, Haymarket, London, S.W.1.

The Shell Petroleum Company Limited gratefully acknowledge the many applications for the post which was advertised recently. Owing to the large number it will be some time before a reply can be sent to each applicant but this will be done in due course.

Leading Pharmaceutical Company has vacancy in the medical department for a Medica Practitioner (Male). This position entails arranging clinical trials with the Company's products, dealing with medical queries and general professional advisory work. The successful applicant will be required to do a certain amount of travel. Minimum salary £1500 p.a.—Apply with full details to : Address, No. 251, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

There will become available an appointment for a fully qualified and fully experienced Radiologist with a Group practice in a Canadian city. Starting salary $10,000 annually (approximately £3500) with good opportunity for substantial increase. Correspondence will be kept confidential.—Address, No. 250, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

Nauru and/or Ocean Island—Central Pacific. Applications are invited for the position of Assistant Medical Officer. Applicants should be British born and have British university degree. Term of engagement 3½ years. Salary £1400 Australian currency p.a. Free board or allowance in lieu thereof. Free housing, partial furnishing. No income-tax. Free passage, full salary on voyage. Intermediate leave of 2 months at end of first 21 months, 3 months at end of contract, but 6 months home leave if re-engaged. Climate healthy, living conditions good. Fully equipped hospital.

Applications in writing, giving full particulars of qualifications and copies of testimonials, to the London Manager, THE BRITISH PHOSPHATE COMMISSIONERS, 2, Grosvenor-gardens, London, S.W.1.

Port of Tema, Gold Coast. Civil Engineering Company requires an experienced Medical Officer at their new Hospital ; duties are medical and administrative, involving a working knowledge of tropical medicine and hygiene ; surgical ability (except for emergency) not essential. Salary £2500 p.a., married quarters and passage both ways for family provided. Tours of service 18 months plus 3 months leave on full pay.—Applications, with full personal details and past and present appointments, to Box L198 LPE 55, St. Martin's-lane, London, W.C.2, by end of November.

Microscopes. Highest prices paid for good modern types. Send or bring your equipment for valuation.—WALLACE HEATON LTD., 127, New Bond-street, W.1.

"Pregnancy Diagnosis by the Xenopus Method," 24-hour service. Send specimen of urine and £1 1s. fee. Hematology, Biochemistry, Flame Photometry.—WELBECK BIOLOGICAL LABORATORIES, 26, Park-crescent, Portland-place, W.1 (MUSeum 5386–7).

Applicants for posts requiring testimonials copied or duplicated should communicate with MANTON SECRETARIAL SERVICE LTD., 98, Victoria-street, S.W.1 (Phone : VICtoria 0141), who are specialists in this kind of work.

Typewriting and Duplicating. First-class work at moderate prices by experienced medical typists. Electric machines. —SYBIL RANG, 21, Heath-street, Hampstead, London, N.W.3 (HAM 5329/0504).

For Sale. Stainless-steel Allen & Hanburys Sterilizer. Electric, perfect. 12 in. by 6 in. Cost 24 guineas, sell 12 guineas. —Write 8, Montague-road, W.13.

A Dictaphone Dictator Machine for Sale, in first-class condition and very little used. Price £80.—Apply, P. A. HELLYER, Esq., Bury Farm, Astwood, Newport Pagnell, Bucks.

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